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Volume 60 American Machinist Number 14

New York, April 3, 1924

Keeping Subway Trains on Schedule

By Fred H. Colvin
Editor, *American Machinist*

The first of two articles dealing with the methods of handling motive power in a most exacting service — Wheels, tires and journal bearings

THOSE who are not familiar with the subways of New York City and their operation, can hardly appreciate the problems which confront the car equipment department of an underground railway, in the daily task of keeping the many trains in operation and on schedule time. The trains are long, running up to ten cars; the speed is high, and the stops frequent on the local trains, while, during rush hours, the headway is almost unbelievably close. These conditions mean that all the equipment must be kept in the best of repair at all times to insure safety to the 2,150,000 passengers who ride each day.

The repair shops of the Interborough Rapid Transit Co. are located at 148th St. and Seventh Ave., New York City. A. Gottschalk, superintendent of the mechanical department, with an able corps of assistants, keeps the rolling stock in continuous operation. These shops handle about 35 cars a day for repairs of some kinds. In this work, with its combination of car and motive power, the different classes are supervised by specialists in each line. All the work, however, is handled in the same plant, which is now being greatly enlarged and improved by the addition of new concrete buildings.

As in all kinds of railway work, one of the greatest problems is the wear of tires. This is particularly true in the case of subways, as the density of the traffic, the greatest in the world, demands high rates of acceleration and retardation, which, combined with frequent stops and sharp curves, cause an abnormal amount of tire wear. To maintain the proper factor of safety under these conditions, a highly developed system of wheel maintenance is required. Both rolled wheels, in which the steel tire is integral with the wheel center, and steel tired wheels, are in use, the tendency being toward the adoption of the wheel with the integral tire. In either case the tires are turned in the same way and both kinds will be seen in the illustrations accompanying this article.

When a car comes in for repairs, it is raised from the trucks by a 25-ton bridge crane with a span of 74 ft. 4 in. Two such cranes are in continuous operation. The trucks are rolled out and carried by the same cranes to the truck shop at one end of the building, where the wheels and motors are removed. For handling the motors and also lifting the truck off the wheels, the air hoist suspended from the gantry crane, shown in Fig. 1, is used. This gantry can be run to any desired point, suitable air connections being provided to which the hose shown can be attached. As will be noticed, the air cylinder is fairly large in diameter, so that no difficulty is experienced in lifting any weight necessary.

Handling Wheels and Motors

After the wheels and motors have been removed from the truck, they are picked up by a 4-ton Shepard monorail hoist. The wheels are carried to the wheel-turning department and the motors to the machine shop. Most of the wheel turning is done on the lathe shown in Figs. 2, 3 and 4. These illustrations show just how the wheels are handled in and out of the lathe. The monorail-hoist lowers the wheels on to a track near the wheel lathe, and they are rolled directly to the wheel lathe, as shown. Auxiliary rails lead clear to the center of the lathe iteself, and an air hoist is provided, so that a pair of wheels can be lifted up from any nearby track and placed directly in front of the wheel lathe. The driving is done by the central herringbone-gear, which has a swinging section, *A* Fig. 2, allowing the axle to pass through the rim, after which the section falls into place and locks itself into a position that forms a continuous gear rim, of the same appearance as a solid rim with no break of any kind.

This sectional gear is shown in more detail in Fig. 3, where the wheels have passed the gear. There is also shown the collar *A*, on the end of the axle, which protects it from being marred by the chuck jaws while being centered and clamped. The actual driving, however, is done by the toothed dogs in each face plate, two being shown at *B* and *C*. With the wheels in place, the heads on each side are moved into position, the collars gripped in the chucks, the driving dogs adjusted, and the cut started, usually on the flange first. Fig. 4 shows the lathe in operation.

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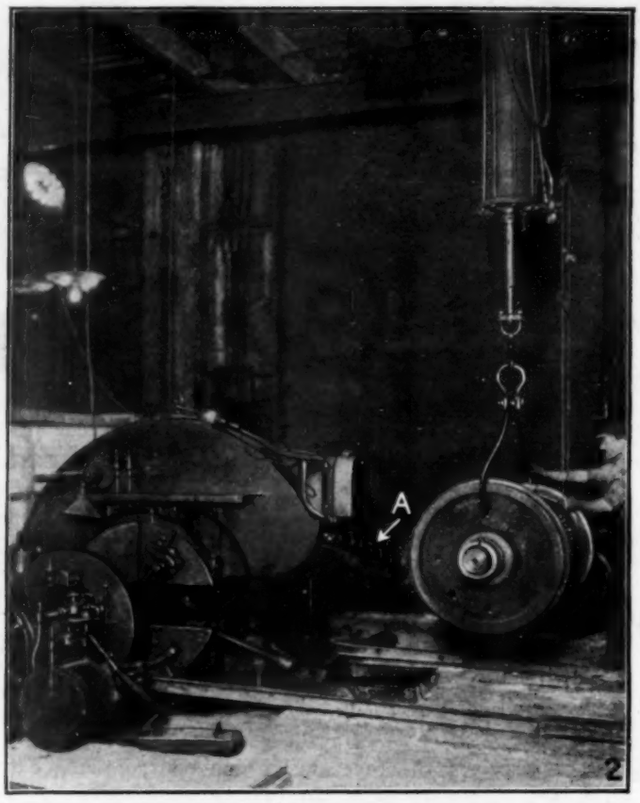
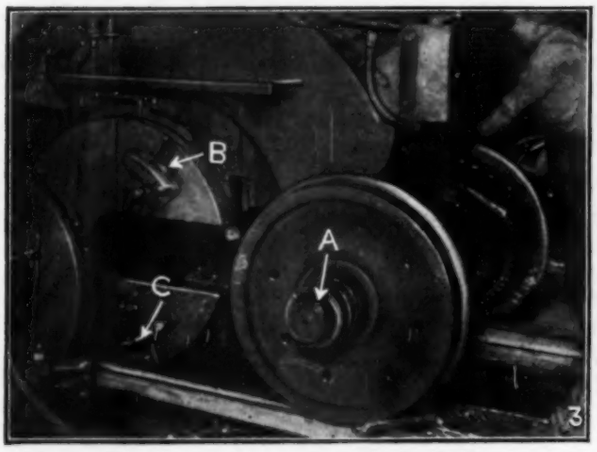
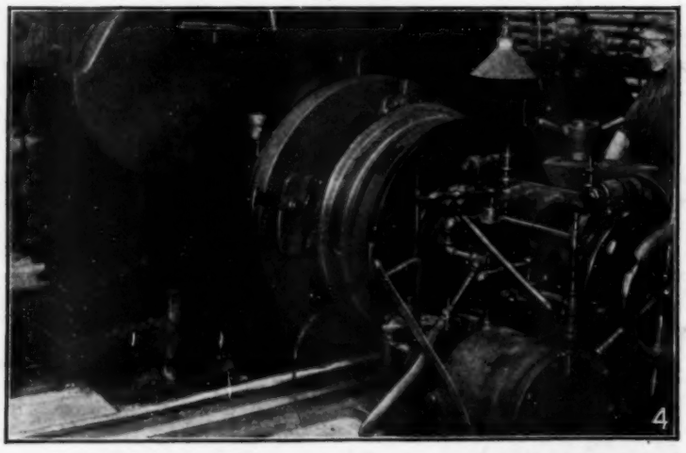
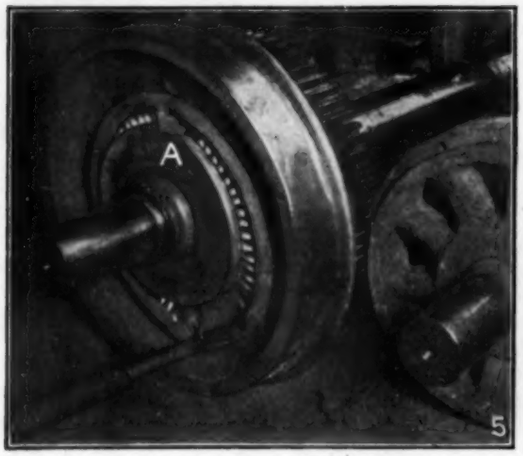








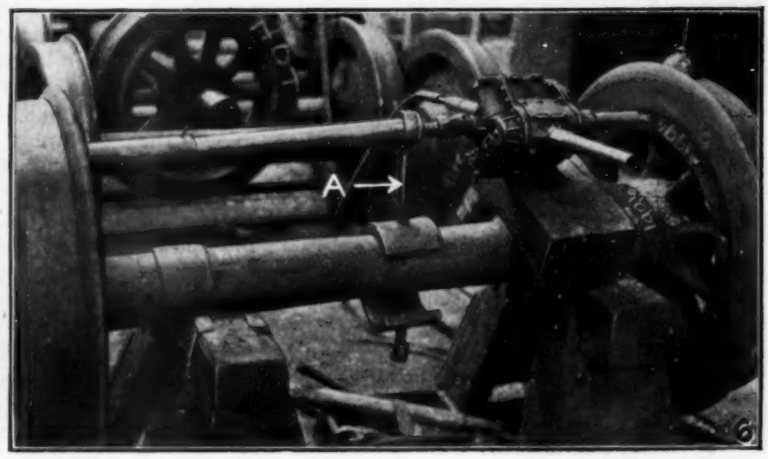


Fig. 1—Gantry crane for lifting motors. Fig. 2—Placing wheels in front of lathe. Fig. 3—Rolling wheels into lathe. Fig. 4—Wheel-turning lathe in operation. Fig. 5—Heating band to remove it from wheel hub. Fig. 6—Drilling for tire retaining bolts

All railway tires are hard, but electric railway men frequently seem to feel that after tires have been in electric service, they become especially hard, although there sems to be no exact data on the subject. At any rate, the wheel lathe shown runs at about 14 ft. per minute, which at least equals the average speed in railway shops.

A heavy feed is used in the roughing cut and the actual time for turning is comparatively short. Then comes the forming tool for the flange and a flat nose tool which starts its cut next to the flange, and feeds toward the outer edge of the tire. Large firm joint calipers are used, and the difference in diameter between the two wheels of the same pair is held to a tolerance of $\frac{1}{64}$ inch.

In an adjoining department is the wheel press, a small part of which is shown in Fig. 5. Here the wheels are mounted and unmounted, a gas ring being used in heating the tires for removal from the wheels. The operation shown at *A* is out of the ordinary and does not represent regular practice. The steel band on the hub of an old-style wheel is being heated preparatory to removal. The gas ring is at work on a solid rolled-steel wheel, while next to it is a pair of wheel centers waiting to have the tires shrunk on. A larger gas ring is used for this purpose, and the jets are on the inside of the ring.

The steel tires used on the wheels have lips, or inner flanges, on the outside edges, the flanges projecting over the outer parts of the wheel centers, so as to allow the

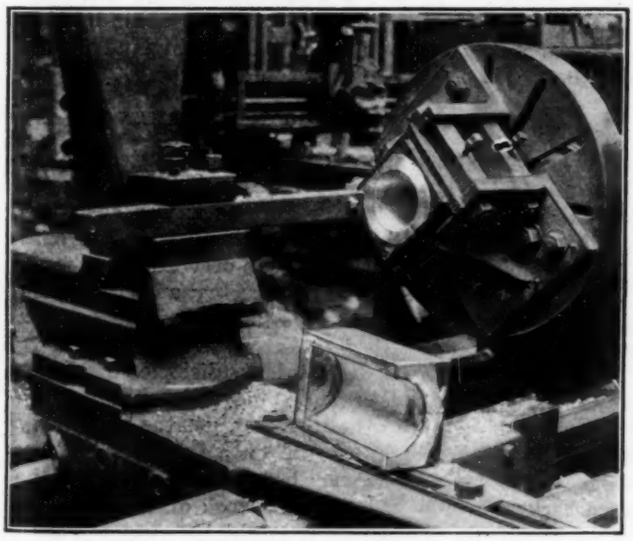


Fig. 7—Boring two brasses at once

tires to be bolted to the wheels in addition to being shrunk on. The exacting conditions of subway service, with the roadbed confined to very narrow limits, the short headway between trains, and the necessity of avoiding accidents and delays, due to loose tires, make this practice necessary.

After the new tire is shrunk on, its flange must be drilled for the retaining bolts, and this is done as shown in Fig. 6. The holes in the wheel centers act as a drilling fixture and guide the drill so that no laying out or center punching is necessary. An air drill is used, the outer or feeding end being held by the support *A*, the lower part of which goes around the center of the axle, and is clamped against turning by the setscrew beneath. This makes a simple but very effective method of drilling the holes.

It was probably noticed in the preceding figures, that the axles are plain, and have no collars on the ends, as is sometimes the case. This construction is to conform

Fig. 8—Putting wear plates in place on axle boxes

with the brasses designed by Mr. Gottschalk. One of the brasses is shown in Fig. 7, and is solid at one end for the purpose of taking the thrust on the end of the axle.

The brasses are babbitt lined, and a pair of them is shown being bored in a special chuck, which is mounted on the faceplate of the lathe. The chuck itself consists of the two angle plates shown tied together with two square bars on each end. Each bar is provided with a substantial setscrew for holding the brasses in position while being bored.

In connection with the bearings of the motor trucks, it is interesting to note the practice which has been adopted for making the life of the journal box itself almost unlimited. As the wear on the outside of the box, caused by its movement in the pedestal jaws of the truck, is fairly rapid, it is the practice to plane out the sides of the boxes after they have become worn, and to bolt in place cast-iron "wear shoes" which present new wearing surfaces to the pedestal jaws. These wear shoes are machined in quantities to a standard size, and the worn boxes are also planed to form a close fit in the pedestal jaws, when the wear shoes are in place. Excessive wear on the jaws themselves is taken care of in a similar manner, except that the shoes consist of standard structural-steel channel sections, milled to fit the surfaces of the pedestal jaws.

The wear shoes are held in place by cone-head, countersunk bolts, as shown in the pan in the lower part of Fig. 8. This view also shows the method of holding the bolts against turning while the nuts are being put in place. A special screw jack is placed between the flanges of the wear shoes, as at *A*, and forces the taper head of the bolt firmly against its seat. This method provides sufficient friction to hold the bolt until the nut has been forced down on the lock washer as firmly as desired. By standardizing these wear plates and always machining the boxes to the correct size to receive them, it is comparatively an easy matter to make the boxes as good as new at a minimum of time and expense.

Book Reviews

The Handbook of Sales Management. By F. Roland Hall. 995 pages 4½x7½ in. Published by McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N.Y. Price $5.

Accurately named a handbook, is this very thorough review of modern sales practice and management. The methods and experiences of hundreds of representative selling organizations are cited to illustrate the various phases of sales direction.

An outstanding characteristic of this work is its practicability due to the specific nature of the examples drawn from sales work on every type of product. Many of the data are presented in such form that they could immediately be adopted where advisable, without any further material than that presented.

In the chapters on salesmen's reports and expense accounts, for example, there are reproduced the exact forms used by over a dozen different concerns. Similarly, in the chapter on "The Automobile in Selling," there are tabulated costs for the expense of traveling, given in detail for each section of the country.

The volume is thoroughly indexed, making accessible the desired information regarding all the phases of sales management covered. For the man in charge of sales direction this should prove a valuable reference work.

Haystacks and Smokestacks. By William Feather. One hundred forty-four pages, 5x7, cloth boards. Published by the William Feather Co., Cleveland, Ohio.

An intensely interesting little book, relevant to all industry. It is not to be read as a contribution to the machinery industries alone; no especial mention is made of them.

There is some of human relations, some of personnel, some of management, a little of selling and a little of labor and laboring, tied up in the three dozen or so editorials that go to make up the book.

Carl L. Svensen, professor of engineering drawing at Ohio State University has published a bolt and nut chart giving the graphical dimensions for hex bolt heads and nuts and for square bolt heads and nuts. The dimensions can be taken directly from the chart by the draftsman without the use of a scale. The size is 5½x8½ in. The price is 5c. per copy or 40c. for ten copies. The publisher is the Milford Book Co., Milford. Connecticut.

The Foreman's Qualifications

By W. Roland Needham

It is a mistake to think that the foreman is expected to be the most highly skilled artisan or the brainiest worker in the department. His job is to get the work through efficiently, so see to it that his team is going strong. The man who can inspire confidence, reduce friction to a minimum, and produce reliable and substantial results, is worth twenty merely clever persons who happen to be just that and nothing else. A good foreman is a wonderful addition to a good shop.

Machine Tools and Labor Saving—Discussion

By Harry Senior

I don't quite get the viewpoint of F. P. Terry, who writes under the above caption on page 363 of the *American Machinist.*

If he means that a man has got to work just as hard to keep up with six or eight modern automatic screw machines as he did to operate one old-fashioned "capstan lathe," I can agree with him. I might even concede that the new machine would keep busy a helper, a toolmaker, and an extra clerk in the office; but is Mr. Terry trying to compare the output of the automatic with that of the capstan lathe—or even four of them—to the advantage of the latter?

Does the works of which Mr. Terry's friend is in charge and which now employ seven hundred and fifty men against the paltry one hundred as at the beginning of his tenure, turn out the same amount of product as then, or does it turn out more than seven and one-half times that amount?

There may be different opinions as to what constitutes a saving of labor. If Mr. Terry's friend wants a machine that will come down and open the shop in the morning, sweep out the office and go through the morning's mail, he will have to hire one; the laws, both of America and England, prohibit their barter and sale. The nearest approach that I know of to a machine that took a man's labors off his shoulders and did the work for him uncomplainingly was in a little seven-by-nine shop located in the outskirts of a New England village near the banks of a sizable stream of water.

The Owner Was a Good Fisherman

It was a one-man shop; owned and operated by the proprietor. Its product was wire goods; hooks, eyes, staples—anything you like so long as it was composed of bits of wire—bent and pointed or threaded to suit. The equipment consisted of a couple of Waterbury four-slide wire machines, a screw pointing and threading machine, sundry belts, pulleys and shafting, and a water wheel.

The proprietor was an ardent disciple of Izaak Walton. He would rather go fishing than work. Often he would come down in the morning, get the machinery started, lock the door and go off on a fishing trip from which he might not return before night. When he came back he would find a pile of work on the floor. It might be salable product or it might be scrap. I don't know which predominated but, anyway, the man lived somehow until he died; and he died fishing.

My conception of a labor saving machine is one that will turn out a given amount of product with less human assistance—including operators, helpers, toolmakers and office workers—than its predecessor. When I can see, for example, a standard automatic machine of a well-known make turning out cast-iron flywheels for automobile engines at the rate of one every three minutes and twelve seconds, machined all over, and try to figure out how I could possibly finish one wheel in five hours on a lathe and compute how many of me there would have to be to equal the rate of production set by the machine, I am compelled to believe that there are machines deserving not only the title of cost reducing, but of "labor saving."

Determining the Selling Price

By L. M. Waite

The profitless cycle through which many businesses pass—A simple calculation that tells you whether you can compete in your market — "Break-even" and "profit" constants

INCREASING production in the hope of meeting competition by reducing cost and later liquidating in order to turn surplus stock assets into cash is a common occurrence in the machine tool industry. The procedure forms a cycle each part of which seems perfectly sound as it is being carried out. Taken as a whole, however, it is unqualifiedly unsound.

During the first half of the cycle orders are reasonably plentiful but prices are low, as they always are in the machine tool industry when compared with cost. Sales and engineering expenses are high but profits are not adequate for the entire cycle and in many cases insufficient even for the prosperous half of the cycle. Under such conditions the shop organization is asked to reduce cost. The answer is always a demand for larger quantities so that overhead may be reduced. The management then thinks of its past history, looks over prospective business, gets an optimistic report from the Sales Department and authorizes an increased production program. The order is often issued against the better judgment of the manager but the combination of favorable opinions, a promising outlook for sales and the dire necessity of making a profit results in his downfall.

Then things run along quite nicely for a while and costs show signs of coming down, although actually they seldom do. Even the banks seem to have hopes for the industry and offer some encouragement.

The next development is that you never have the right things to ship promptly. As a result quantities are again increased on other sizes or on other types because it is reported that the prospective trade will not wait for a two to three months delivery. With the additional production orders more money is tied up in stock and work in process. This part of the cycle develops gradually, optimism obscures vision and past experience is forgotten. Then a cloud appears, things are slowing up. For some time optimism insists on regarding the slowing up as only temporary but presently representatives begin to report price cuts and new designs and methods that make obsolete much of the stock you have been building over a long period. This finally becomes disquieting, although you proclaim to the world that you take it with a large grain of salt. Finally, however, you begin to look around and check up and you find the payroll very high, especially the non-productive part of it. There is enough stock and work in process to have sunk you long ago, the Sales Department is loafing and in need of a general overhauling and if you have dealers they are "laying down."

The Sales Manager catches it first. He is told not once but many times of the general inefficiency of his Department and himself. Then the Works Manager has the same experience. The banks begin to discourse on frozen assets much to the disquietude of the treasurer. The next move is to liquidate some of the out-of-balance stock in order to get some of the work in process finished before it becomes obsolete.

You are now well launched on the second half of the cycle and the sailing orders say very clearly "Liquidate." Everybody in the organization, the treasurer, especially, agrees to its being a necessity. It is. The Sales Department is very sure that the situation can be saved if prices are right. The management agrees and although no change is made in the list price the salesmen are told to "get busy and send in inquiries and you will get the price that will land." If the events just described have never happened in your shop you will have no interest in what follows.

It has been my privilege or misfortune, which ever you may wish to call it, to watch the repetition of this heartbreaking cycle for twenty-five years. I have been through the thrills of the first half and the criticisms of the second half and I have listened to all sorts of remarks, from office boy up and from president down. To me it all points one way and has led to but one conclusion, the urgent need of a sound method for determining the selling price. During this period I have

NO MATTER how skillful a manufacturer may be in the technicalities of production, his business will soon fall by the wayside if his selling price is not correctly determined. The plan of arriving at a sound selling price, as described by Mr. Waite, sounds absurdly simple. It is really so simple that one is led to expect a catch in it somewhere. As a matter of fact there is no mystery about it whatever. The "break-even constant" can be worked out for any product in a few minutes so that you can tell exactly where you stand as compared with your competitors. If you still have doubts after reading the whole article, try it on your own business for last year. This done, the chances are that you will want to try it on current business.

worked out plans and tried out theories. I have fallen off "peaks" and landed in "valleys." I have fussed with averages, I have read everything I could find on cost but I have always come back to the point where the other fellow and traditions were the real determining factors in the sales price of machine tools. For instance, I found that years ago some bright individual had associated the word "pounds" with the machine tool industry and that the tradition had stuck.

Within the industry I have found so many people imbued with the idea that dividends are paid out of volume rather than out of profits and so many laboring under the impression that dealer sales are the only sales, because it costs you nothing to sell unless they sell, that it has seemed almost impossible even to think of developing within the industry the idea that the profits from machine tool building should represent what accrues to ownership after all costs and expenses of operation have been paid and that expenses outside of shop cost should not be dealt with loosely any more than should material or direct labor expense.

From all of this I found that I needed for my own use as an executive, a constant or table of constants that would enable me to know quickly and with certainty the break-even sales price of a machine or tool on which the shop cost was a known or carefully estimated number of dollars and cents. I wanted the facts both as a sales and as a managing executive. As a sales executive I had to have them to instill necessary price and non-profiteering knowledge into the sales force and thus into the trade, for the trade will generally pay an honest price for what it needs. As a managing executive I needed the facts to enable me to stop losses, even at the expense of volume if necessary, and certainly at the expense of out-of-balance manufacturing volume.

Shop Costs Must Be Trustworthy

Accordingly I had an estimate sheet prepared that would present to me in recapitulated form under the three headings of material, labor and overhead, my shop cost for all the sales being included somewhere in these items. This plan provides that responsible shop authorities must stand back of the sheet. It must be vouched for by someone who has more authority than a cost or estimate clerk.

I now determine the total cost per year of operating the business over a selected number of years and easily calculate how many dollars' worth of business is needed to carry on. Then I figure a sales expense percentage on dollar sales, not on cost, covering a period of ten years, not including war years. I also determine the general expense percentage on sales dollars, not on cost just as I did the sales expense percentage.

Now I have shop cost including all items of expense belonging there. I have a predetermined sales expense percentage on a certain volume of business, and I also have a predetermined general expense percentage for a certain volume of business. Consequently I know what the required volume of business is. The items mentioned include every item of expense whether for production or service. The system aims to get back at least every one of those dollars in slower-than-normal times for if I can get them back in slower-than-normal times I am bound to make something in normal or better-than-normal times even though I have not provided any percentage for profit. In other words I have established the lowest price at which I can sell and break even and thus prevent loss. By this process of sales price determination the selling price is the unknown quantity to begin with but whatever it finally proves to be it is 100 per cent both before and after it is determined.

Now assume that by the method above you have found that you require $500,000 worth of business each year to carry the expense that will be incurred on a low-average basis. Assume also that your carefully figured out total sales expense is 15 per cent and that your carefully determined general expense is 18 per cent of this $500,000 worth of business. Remember the $500,000 represents sales, not cost, and is the minimum amount of sales necessary to carry your total load safely.

To determine the selling price of a machine or tool, take the recapitulated sheet and you will have

Shop Cost	
Material	$xx.xx
Labor	xx.xx
Overhead	xx.xx
	xxx.xx

To the shop cost you must add your sales expense of 15 per cent and general expense of 18 per cent. Your 100 per cent selling price will then include 15 + 18 or 33 per cent sales and general expense. The shop cost is consequently 67 per cent of the selling price.

Now, if you divide 100 by 67 you get roughly 1.50, a factor that I call the "break-even constant."

As an example suppose we assume the following shop cost items:

Material	$ 92.50
Labor	362.00
Overhead	543.00
Shop Cost	$997.50

Multiply the shop cost, $997.50, by the break-even constant, 1.50, and you get $1,496.25. This figure is your selling price if you expect to break even.

At times it has seemed to me that people of the machine tool industry were afraid to make money except when business is booming, but I have in mind a well-known, fundamental economic fact that when profits are inadequate, replacements are neglected, credit is withdrawn and the enterprise finds itself in trouble to say the least.

The example just given makes no provision for profit. If you decide you are entitled to 12 per cent profit on the sales price you can get a new multiplying constant by adding 15 per cent sales expense, 18 per cent general expense and 12 per cent profit expense to give a total of 45 per cent. Subtract 45 from 100 and divide the difference into 100. The result is 1.818 or nearly enough 1.82. Multiply the shop cost, $997.50 by 1.82 and you have $1,815.35, which is the selling price you must ask to make 12 per cent profit.

It is now easy to arrange an instantly available table of constants to fit your particular enterprise. Those used in the foregoing are only an example.

Right here I want to sound a warning. Bear in mind this one thing. It is vital. This plan has nothing whatever to do with your shop costs or estimates. It is no part of your shop cost system. It simply takes your shop figures and determines for you your break-even selling price or the selling price that will give you the

profits desired as indicated by your selection of a multiplying constant. There are other advantages in such a system as this. One of them is that it gives you a line on whether or not the market will absorb your product at what you, not your competitors, decide is your necessary selling price, even clear down to the break-even price. In other words you locate your marginal position. Suppose now that your marginal position is not satisfactory. If you know that your sales expense is accurate and that your general expense will not permit of change, you can reduce your dollar cost to hours and tell the shop how many manufacturing hours they must cut off to enable you to break even to meet competition. Thus you get the shop's answer and know where you stand before you start. If you can't get the price you should get, you will find that generally you will not start but will rather spend your sales expense dollars in going after something on which you can make some money. This is a far better proposition and a far less expensive policy than one of building up out-of-balance stock or slow-moving stock or carrying thousands of dollars' worth of work in process. As I said at the beginning of this article, the "Quantity" method of reducing manufacturing costs which usually results in forced liquidation is always detrimental to the individual enterprise and to the entire machine tool industry as well.

Another advantage of the system is that it gives you a check on competition. If your shop is anywhere near efficient your competitor cannot produce in many hours less than you can and you can easily determine how many hours manufacturing he must be allowing under your percentage. Application of the system is practicable to the manufacture of standard, semi-standard or special machinery and permits the proper attention being given to the element of time.

It also serves as an automatic danger signal for it scents danger ahead even when you are in a hurry or your mind is on a golf game.

It serves as a constant investigator for you because it keeps cost and estimating departments out of ruts as it is continually asking "why".

It eliminates all thought of "pounds" in the machine tool industry.

It educates the sales department to the fact that machine tools cost real money.

But there is absolutely no magic in it. It has only the homely virtue of presenting to you almost instantly the facts that determine your selling price. In it there is no provision for supplying the requisite amount of nerve to look these facts in the face and then act accordingly. To those who possess the nerve, however, the system will eliminate the hair-graying half of the cycle, and even then there will be plenty of things left for the manufacturer of machine tools to worry about.

The Extrusion and Drawing of Brass Rod

By Jack Williams

ALL toolmakers and most mechanics are familiar with "cold-drawn" brass rods—rounds, squares, hexagons and other shapes—but it is probable that comparatively few of them have ever seen them made. Here is a brief description of the process as practiced by the Bridgeport Brass Co. in the production of commercial rods.

The metal from the electric melting furnace is cast into a billet-mold, which is an iron container, swung upon trunnions, about 6 in. in internal diameter by five or six feet in length. One end of the resulting billet is sawed off to remove imperfect metal and impurities that may have collected at the top of the casting, and it is then thoroughly cleaned over its entire outer surface and inspected for flaws and seams.

Fig. 1—The extrusion machine and furnace

The billets are delivered to a rack, or apron, at one end of a long inclined furnace and are allowed to roll through by gravity to the opposite end, from which they are delivered with periodic regularity, heated to a temperature necessary to render them capable of extrusion. A definite number of billets, determined by the time required to heat them, is maintained in the furnace at all times, and as each billet is removed in turn from the lower end, another is allowed to enter at the upper end of the furnace.

The extrusion machine is shown in Fig. 1, and in Fig. 2 may be seen some of the extruding dies. The machine is a hydraulically operated horizontal press having instead of the usual ram, a long plunger of the same diameter as the billet to be extruded. The heated billet is confined within a cylinder, the outer end of which is closed by the extruding die, while the other end is open to receive the plunger.

Die Not Rigidly Fixed

The die, though forming the end of the cylinder, is not rigidly attached thereto but is supported by a carrier, also hydraulically operated, that allows it to be detached from the cylinder and to move outward with the advancing billet as the cycle nears completion; for not all of the billet can be pushed out through the die, and to allow the remaining portion to cool in the cylinder would seriously interrupt the clocklike regularity of the movements.

Once started, the movements proceed with the utmost precision. A billet is taken from the furnace by operatives whose sole duty it is to have a heated billet ready to introduce into the cylinder whenever the latter is uncovered by the plunger, the plunger is started on its forward movement and at the same time a die is being pushed into place by the carrier. The plunger continues its forward movement without hesitation, pushing the metal out through the die until there is

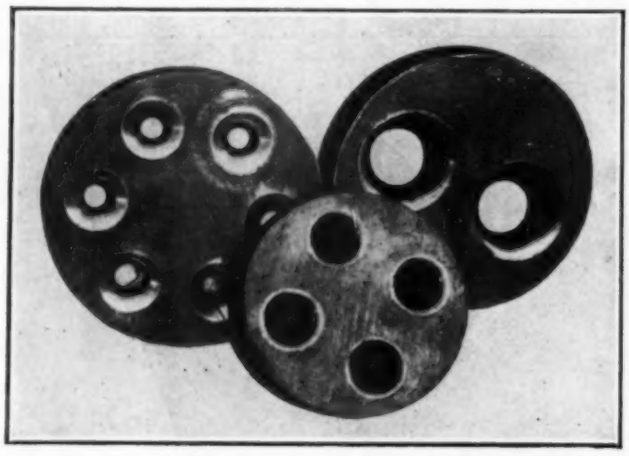


Fig. 2—Some of the extruding dies

a slug of but about 4 in. in length remaining in the cylinder, when the carrier automatically unlatches and the die and remaining portion of the billet, with the extruded rods still attached, are pushed away from the machine by the advancing plunger.

The plunger now reverses its direction of movement and, while it is withdrawing, the die is lifted out of the carrier to have the slug sheared off and the rods removed, and another die is dropped into the carrier to be returned to the cylinder, which it reaches in just about the time to meet the next billet.

The dies are made of a special grade of steel that possesses the property of retaining its hardness even at low red heats. Almost any shape within reason may be extruded, and the process is extensively used for the production of special rods in an infinite variety of section.

In Fig. 3 is shown a typical draw-bench upon which round, square or hexagon rod of any required size is

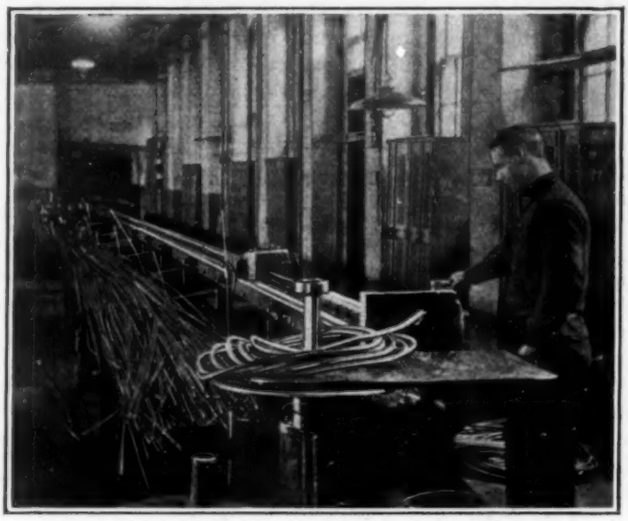


Fig. 3—The draw bench

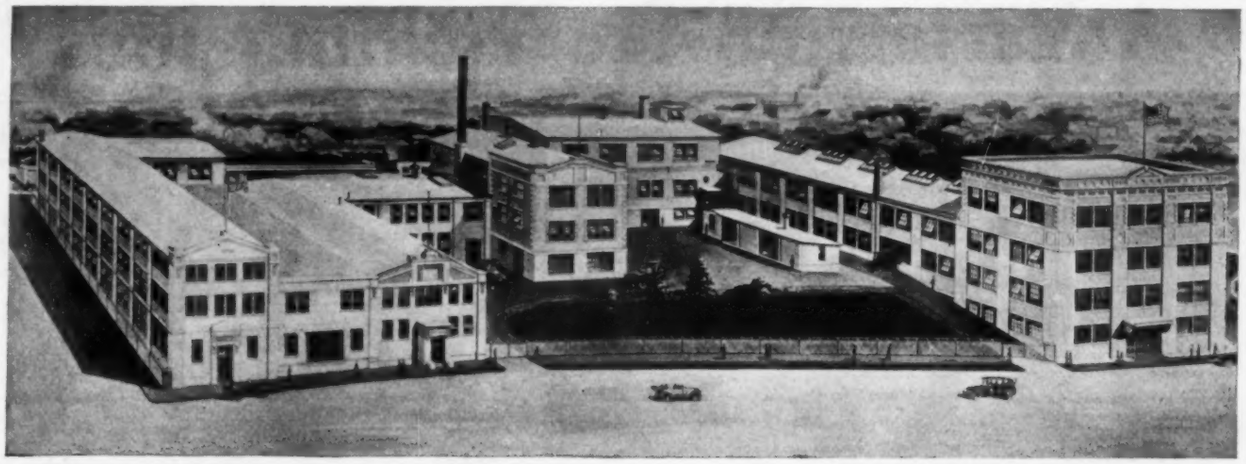
produced. It consists of a long runway of cast-iron to which is gibbed the drawhead *A*, moved back and forth over the length of the runway through the medium of chain and sprockets by a powerful reversing motor located at the farther end.

The drawing die is mounted upon the bracket *B* at the operating end of the runway and the movements of the drawhead are under control of the operator in his regular position. In the picture the operator's right hand is resting upon the lever of the motor controller.

The rod to be drawn comes from the extrusion machines or the annealing furnaces roughly coiled for convenience in handling and with one end reduced by swaging (in a separate operation) to pass through the drawing die. The drawhead is provided with jaws that grip the rod automatically and the operator has only to bring it close enough to the drawplate to introduce the protruding end of the wire, push the controller to its forward position and allow the length of the coil to be drawn through the die.

Simplification of File Styles

A report submitted by the manufacturers under date of Oct. 9, 1923, made provision for a reduction in the varieties of files from 1351 to 454, an over-all elimination of approximately 66 per cent. The recommendations, in accordance with approved practice, have been submitted to and accepted by the distributors and others, thus completing the procedure as a national schedule, which becomes effective July 1, 1924. Meetings were held under the auspices of the Simplified Practice Division of the Department of Commerce, the American Engineering Standards Committee and the United States Chamber of Commerce.

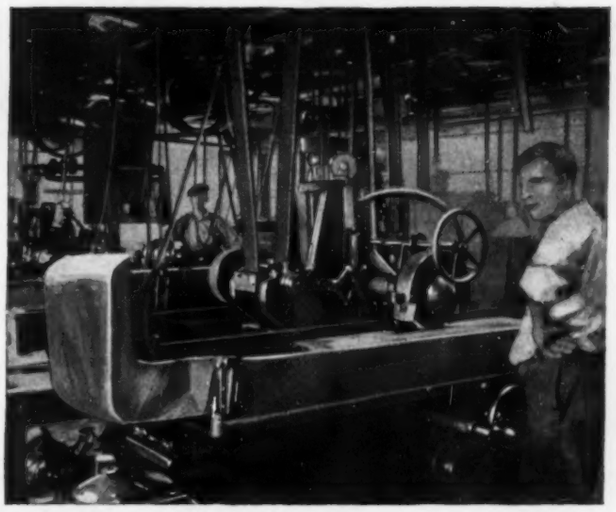


Where Machine Tools Are Made

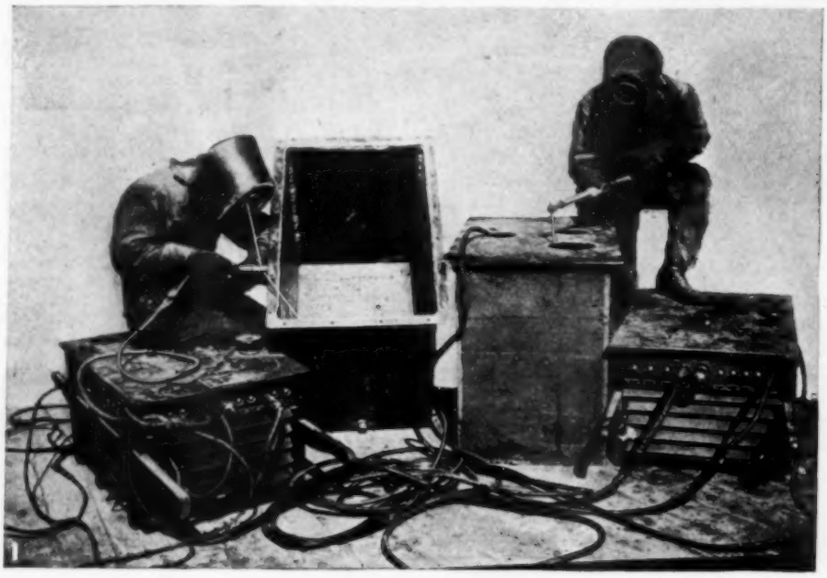
The J. N. Lapointe Company

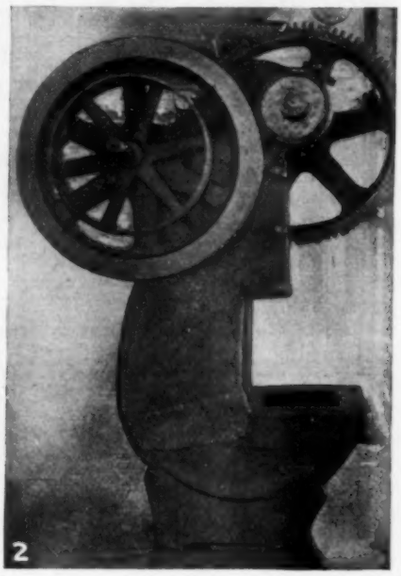
New London, Conn.

Founded 1911



A Variety of Arc Welding Jobs





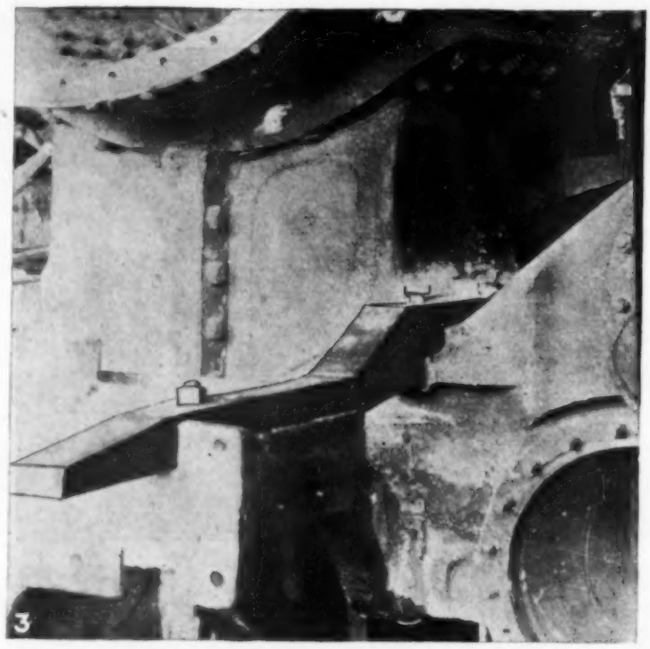


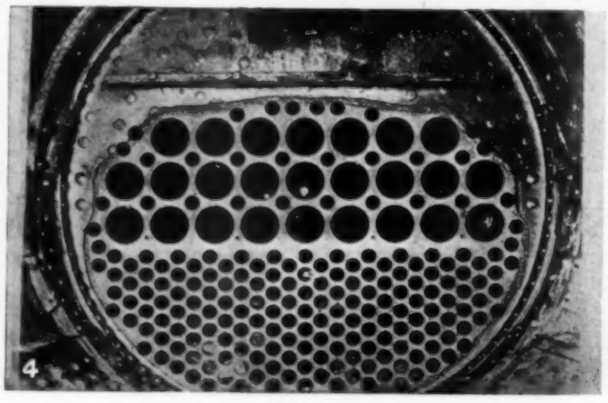
Fig. 1—Building up tanks from sheets and angles

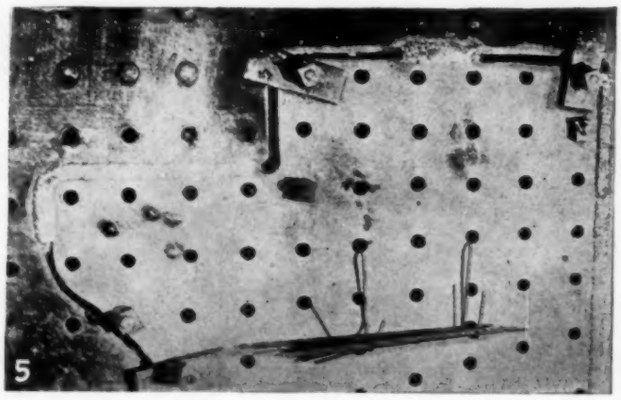
Fig. 2—The repair of a serious break in a punch press frame

Fig. 3—Extensive welding of a locomotive saddle casting

Fig. 4—Complete new tube sheet applied to boiler

Fig. 5—A large patch flush-welded in fire box (250 lb. pressure on one side, fire on the other)





In Railroad and Repair Shops

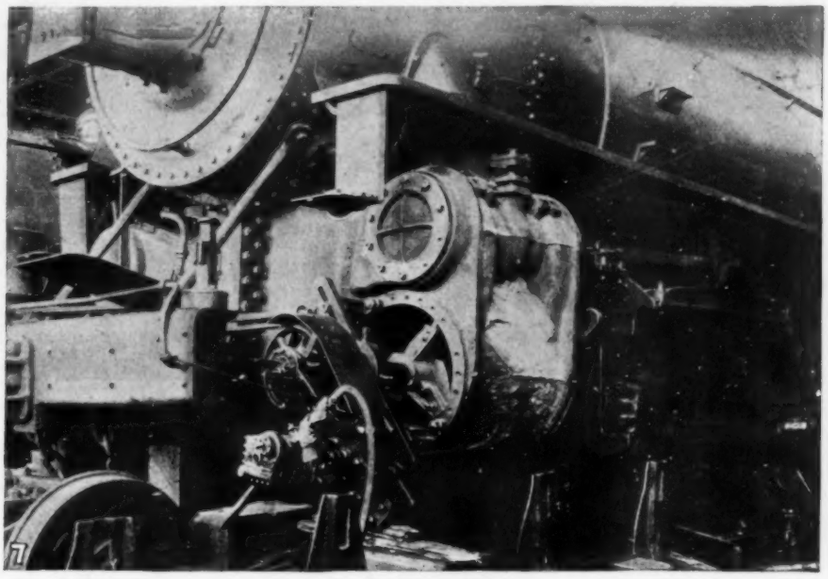


Fig. 6—Welded locomotive cylinder casting being rebored in position

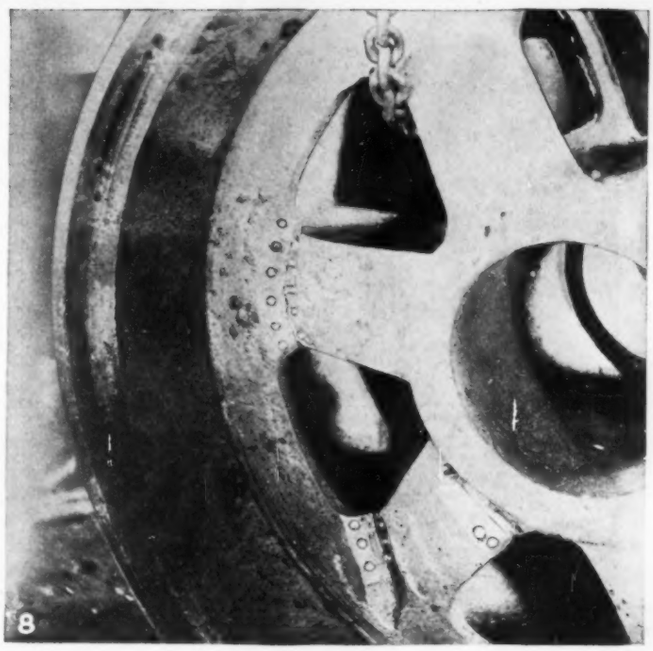
Fig. 7—A padded hand-hole opening

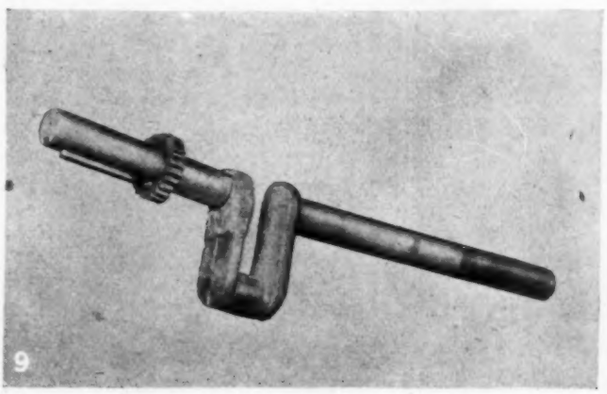
Fig. 8—An example of studding, preparatory to welding. The piece is a drum for a belt conveyor.

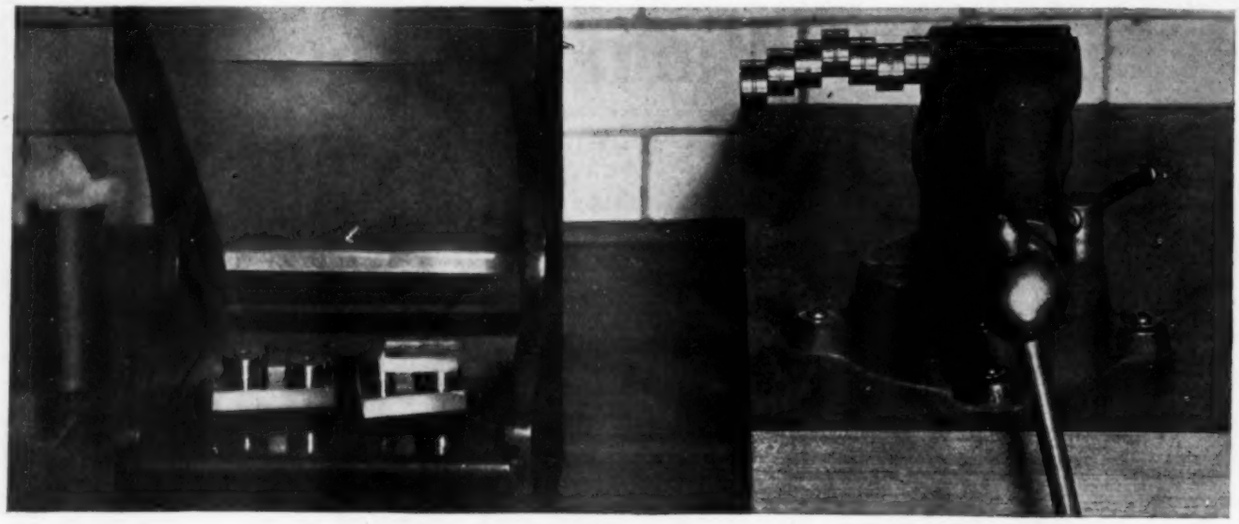
Fig. 9—A repaired crankshaft

Fig. 10—Welded automobile rear end

Photographs by courtesy of the Electric Arc Cutting & Welding Co., Newark, N. J.





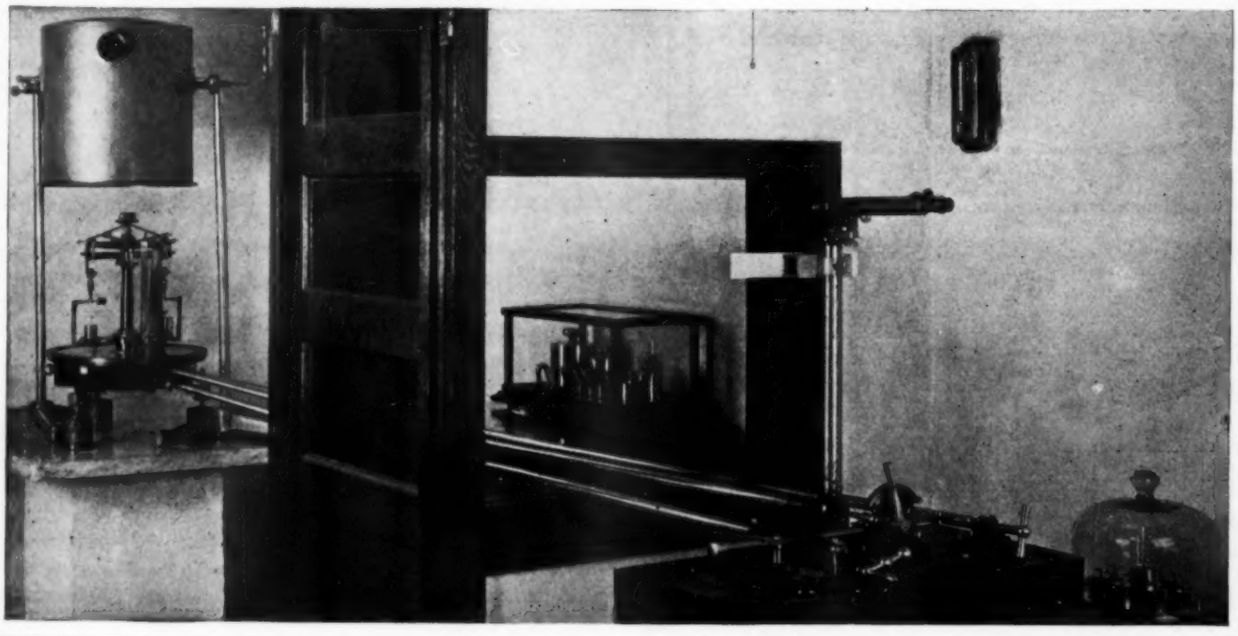


It Can Be Measured at the Bureau of Standards

Fig. 1—Precision gage blocks produced by the Hoke process. The blocks in the vise are held together by the molecular adhesion between their flat surfaces. The others are shown in connection with optical glass

Fig. 2—Optical glass (used for testing plane surfaces) produced in the experimental plant of the Bureau. The largest pieces weigh about 1,000 lb. each

Fig. 3—Precision balance which can weigh to one part in 100,000,000. It is observed and operated from outside the room lest the heat of the operator's body cause an error



Suggestions on Inventions and Patents

By Roswell F. Hatch

What to patent—Scope of patents and their values—How to obtain inventive ideas and insure their benefits—The manufacturer and the patent attorney

THE question as to which inventions shall form the basis of patent applications, is frequently arising in most manufacturing plants. If the plant has its own patent department, the attorney will have or can get the information to enable him to answer this question. If an outside attorney is called upon, however, this question is seldom put to him and he is simply told, "We want this device patented." The attorney naturally supposes that the manufacturer believes the patent will be worth its cost and, therefore, he files an application if he thinks the device patentable. Moreover, the plant engineers would often be offended if the attorney should question the advisability of filing an application, and would very likely not only object to paying for the advice, but would also go to some other attorney who would carry out instructions without question.

The object of this discussion is to point out some of the factors to be considered by the manufacturer in deciding whether to file an application, without going into the complicated legal questions which may arise where patent litigation is involved.

If the invention is to form a regular product of the company, good patent protection is always desirable. The question then is: What is good patent protection from the manufacturer's point of view?

Patent Protection

On small devices, composed of but few parts and these closely associated and co-operating, any patent whatever will probably be of some value against infringers. If the device is large and complicated, such as the larger machine tools, the problem is more difficult. Suppose, for example, a company has brought out a new lathe. Many of the details are new in a slight measure, at least, and the general appearance is noticeably different from those in common use. The manufacturer would like to be able to stop any competitor from making a machine looking like it as a whole, or copying any detail. It might easily require half a dozen patents to cover the various novel features and the cost of these would be too large to be incurred without thought. The selection of the features on which applications are to be filed is well worth careful consideration.

One feature of this lathe may be the spindle oiling device. This will perhaps require a separate application and cost well over $100. Is it worth it? How much would it hurt the machine as a whole if some old device were used for that purpose? Is the device really better or just different? Could the designers have produced easily a totally different arrangement that would do the work as well? The first question should not be, "Is it patentable?" but, "Is it really a valuable addition to the machine?" These questions are for the engineers to answer and not for the attorney. It is reasonable to suppose that the engineers are more competent judges of machinery than the attorney unless they are sadly out of place in their jobs. Even in the case of a little understood basic invention, the expert in the particular art, with his training and experience, should be better able to foresee possible value than the average patent attorney.

Value of a Patent

A patent will not create value in an invention where none existed before. If the invention is really valuable, a patent should increase its worth greatly, but a patent on an impractical idea is of use only to a certain class of stock promoters who find the word "Patented" to be good bait for suckers. The decision as to the value of an invention is sometimes extremely difficult, and it is well known that some of our famous inventors struggled for years to prove that there was merit in their ideas. Most of such questions that come up in machine shops, call for plain mechanical "horse-sense," and when the utility of a device is uncertain, it can be tested in a comparatively short time.

The decision as to patent application comes to this: If the invention is going to earn money for the company, if it adds to the value of the machine of which it forms a part or aids in selling your goods, then it is worth patenting. Some manufacturers believe that a patent has an advertising value and if this is believed to be true, it is another reason for filing an application.

There is no value in a large number of patents unless each one covers a valuable device. Some seem to think that each patent obtained adds to the firm's assets, but this does not necessarily follow. If a large number of patents are wanted, irrespective of what they may cover, it would be just as well and much cheaper to buy them from inventors who have found them worthless and would be glad to get $25 apiece for them. Of course, if the company has unlimited capital to gamble with, perhaps one out of a thousand promiscuous patents might prove valuable in the course of its life where no one, at the time of filing, could see any merit. The average machine manufacturer, however, wants to see some promise of returns before he spends money on patents.

Patents are sometimes taken in order to shut off possible competition, with no intention of manufacturing under them, but unless the applicant is unusually familiar with patent matters, the advice of the attorney is essential in order to prevent filing applications which will be ineffective as bars to competition. It is impor-

tant that the attorney be informed as to just what use is to be made of the patent. Many times, if the attorney understands the situation, he can point out the inventions necessary to close a certain field against competition.

Concerning Patentable Ideas

If the decision as to patents rests with one man, he should be broadminded enough to examine any alleged invention without prejudice, and be able to see not only the exact device presented to him, but also any possible value in the idea lying back of the concrete embodiment submitted. The chief engineer who is jealous of a tracer who submits an honest effort to improve the company's product, is a detriment to his company. Many times the draftsman at the board or the operator of the machine can suggest improvements, or point out where an obvious improvement is needed, which would never be apparent to the engineer. It is necessary to examine many wild ideas in order that the occasional valuable suggestion may be found, but in the long run there will be sufficient wheat in the chaff to pay for the time spent. Failure to give suggestions from employees proper attention and to give the inventors at least official recognition of their efforts, if successful, has caused the loss of many valuable inventions.

If a company is going to keep up with the times it must surely, though perhaps slowly, improve its product. This generally means that some experimental work must be done but it does not necessarily mean the installation of an elaborate laboratory. Neither does it mean that twenty-five patents must be applied for each year where there were formerly but two. Patents alone may be no indication of progress. You can hire a first-class technical graduate, put him in an expensive laboratory and tell him to invent something. He may possibly produce a patentable invention every month, but when those patents have expired, they may not have earned one cent for the company. Inventors in mechanical arts generally are born and not made. No amount of education or research work will produce or replace natural mechanical ability, sometimes called "Yankee ingenuity."

Progress in inventive research, to my mind, means getting a man with ideas and providing him with the means to work them out. If the manufacturer has enough confidence in an idea to spend money in development or experiment, it is worth getting advice from his attorney, and, if he has the attorney that he should have, the advice is worth following. The device which is shown to his attorney need not be designed in commercial form, or even operative, in a commercial sense. It should, however, be capable of operating sufficiently to produce the desired results. In some cases a verbal disclosure to the attorney is sufficient to enable his draftsman to prepare a patent drawing of an operative device, if an application is to be filed at once. Some complicated machines are not completed ready for the market for years after the conception of the basic novel idea, and in this case it is often desirable to file another application, based on the commercial form of the invention. An invention which will obviously require some time in development should, as a rule, be discussed with the attorney without waiting for the final perfection.

Should a decision to file an application be reached, it is of great importance that the earliest evidence of conception of the invention shall have been carefully preserved. This evidence will often be in the form of sketches or drawings, and all these should be signed by the inventor, dated, and witnessed preferably by two men who can be found after a number of years, in case of need. The witnesses should be capable of understanding the invention, and at least the general principle should be explained to them at the time of signing. The necessity for preserving evidence was so firmly impressed upon one man, after losing a suit on account of lost sketches, that no scrap paper is allowed in his shop. Each draftsman has a loose leaf book with each page numbered and he must turn in his book with no pages missing, when it is filled. No limit is placed on what may appear in the book, and it is used exactly like the block of paper which most men have on their boards, but it makes certain that no more rough sketches will be lost.

Plants which depend upon the services of an outside attorney in general practice must use greater care in patent business than those which have an attorney observing their development work. The outside attorney should be consulted, to a certain extent, in the same way one consults his doctor. A sick man does not go to his doctor and say, "I want my appendix removed as soon as possible." Instead of that he goes, or should go, as soon as he has a severe pain, tells him the whole story, and thereafter does as the doctor directs. In much the same way, if a manufacturer believes he has an invention of value, he should consult a reliable attorney, not necessarily to obtain a patent at the earliest possible moment, but to get his advice about a business of which the average manufacturer knows no more than he does about medicine.

Know Your Customers

By F. K. Rhine
General Export Manager the General Fireproofing Co.

To handle any market most effectively, there is nothing more important than to know the market—not only to have an intelligent appreciation of its possibilities, but to have a sympathetic understanding of what your customers think of you and your product. A week's personal observation on the ground is worth more than a lifetime of long-distance reports. Your agents and customers and prospects will talk to you in a way in which they would never write; and it is worth a lot to know why your goods sell—or even why they don't. By a personal visit you can find out, as in no other way, how the buyers regard your local representative and his methods—than which few things are more vital to your success. You can see what sort of impression your advertising makes. You can see what changes have taken place in that market and can gage its possibilities for business—often discovering possibilities that you had not dreamed of. You will gain a better appreciation of the obstacles to be overcome, a clearer realization of just where you stand. You will see why each separate market is an individual problem. And you will be enabled to check up your policies and methods in a practical way, making sure that they are contributing to your success as they should, and are not needlessly hindering progress at any point.

Excerpt from speech delivered at the Export Managers' Meeting, New York, March 18.

Laboratory Tests of Non-Metallic Gears

By H. R. Moyer
Westinghouse Electric and Manufacturing Company

Work done to determine strength and endurance—Evolution of the testing equipment—Tests for vibration and effect of oil—Reproducing service conditions

A MORE appropriate title for this article would probably be "The Difficulty of Making Laboratory Tests to Determine the Strength and Endurance of Gears of Non-Metallic Material." It is conceded, of course, that this difficulty exists also, and to even a greater degree, in the testing of metallic gears; but we were here concerned only with non-metallic gear material, chiefly in the nature of composite self-sustaining material such as Micarta.

Non-metallic gear material of the composite self-sustaining construction, such as is used for Micarta gears, is somewhat new to the trade generally, having been put on the market within the last eight years. Within this time it has, however, come into quite extensive use in both the industrial and the automotive fields. Shortly after this material was developed and its possibilities as a silent gearing material recognized, a systematic testing program was arranged with the following objects in view: To compare the relative merits of this material with other non-metallic gearing materials and establish a safe working stress, to check the effect of speed on the load carrying capacity, to determine the wearing and strength properties of various pitches and formulate a relation between the pitch, number of teeth and face width of the gear. The test work referred to was carried on by the Westinghouse Electric & Manufacturing Company.

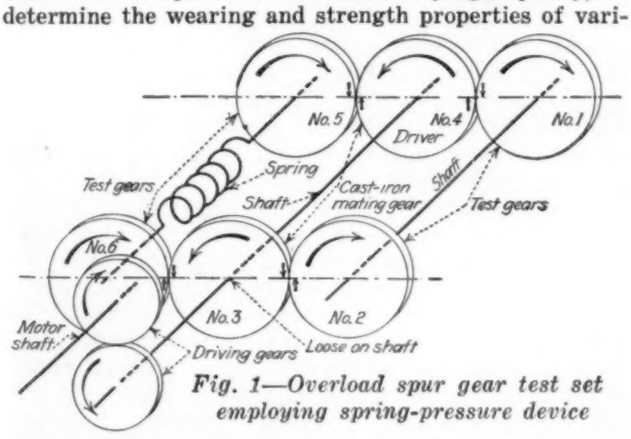


Fig. 1—Overload spur gear test set employing spring-pressure device

Unfortunately, due to various circumstances, such as modifications in test equipment to hasten the tests, study of various base materials and development of tests to meet more nearly actual service conditions, some of the objectives pointed out above were not definitely attained. A brief description of the various test sets and the manner of making the tests follows, together with the reasons for changing from one kind of test or testing equipment to another.

The first apparatus for testing consisted of a motor and generator set with a cast-iron gear on the generator shaft meshing with one of the various non-metallic test gears on the motor shaft. Both gears were of 10 normal diametral pitch, and had 60 teeth with a 30 deg. helix angle and ½-in. face. A load of 5 hp. at 1,320 ft. per min. pitch-line speed was transmitted, which, assuming a fiber stress of 5,000 lb. per sq.in. for the test gear, corresponded to a load of nearly 500 per cent as calculated by the Lewis formula. An indicator was attached to the generator shaft to record the number of revolutions in any given test run. The gears were run to destruction at this load. Several test runs were made with gears of the number of teeth and helix angle just given, after which the number of teeth was increased to 70 and the helix angle reduced to 12 deg. 6 min., the pitch-line speed being consequently increased to 1,470 ft. per min., since a constant-speed motor was used.

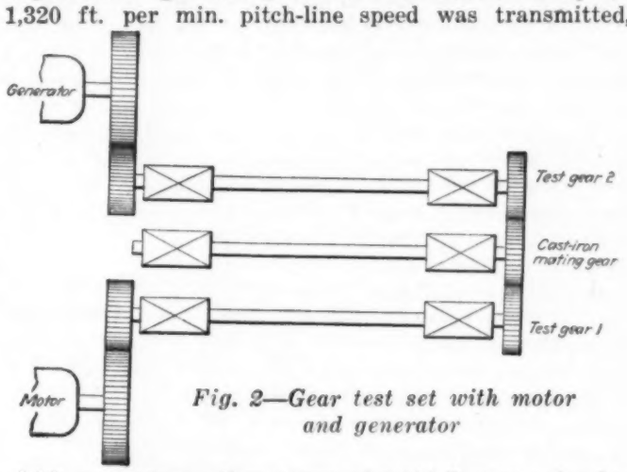


Fig. 2—Gear test set with motor and generator

The important conclusions of this test were that gears with the smaller helix angle had a life several times that of those of the same material with the greater helix angle, and that in both cases, the self-sustaining material outlasted from 1.5 to 3 times the other non-metallic gearing materials tested. This greater durability was obviously due to better wearing qualities resulting from a harder and smoother wearing surface.

As only one gear could be tested at a time, and as each test took from two to five weeks for completion, the next step was to devise a testing machine whereby several gears could be tested at the same time. The test set first made consisted of a number of parallel shafts accurately aligned, with several test gears in the train. A motor provided the power and a generator the load. It soon became apparent that a test of this kind was not desirable since, due to bearing and tooth friction

losses in the train, the load varied considerably on the different test gears. After making a few runs with inconsistent results, this type of testing device was abandoned.

A schematic layout of the gear testing set which was next developed is shown in Fig. 1. A heavy spring was used to provide pressure on the teeth of the test gears. This spring was calibrated, and by means of a ratchet and pawl its tension was adjusted to give 185 lb. pressure on the test gears at the pitch line. Gear *3* was loose on the shaft so that the spring tension could be carried from one end of the spring through the train back to the other end. The motor coupled to the center shaft was operated at a speed giving a pitch-line velocity of 2,000 ft. per min. to the gears, and at this speed and tooth pressure the resulting load, based on 5,000 lb. per sq.in. fiber stress, was approximately 500 per cent of the rating of the gears.

It soon became apparent that the load on the different gears was not the same when the device was running. Referring to the sketch and noting the direction of rotation and the spring pressure at the points of contact of the teeth as represented by the large and small arrows, respectively, it is evident that with gear *4* driving gear *1* the driving force is acting on the teeth in the same direction as the pressure from the spring. At the point of contact between gears *4* and *5*, this driving force is in the direction opposite to the load from the spring. Gear *1* is therefore carrying a larger load than gear *5*. The same is true of gears *2* and *6*. Gear *1* then carries the heaviest load with gears *2*, *6* and *5* next in order.

Using the same bearings and frame work for the bearing housings, the test set just described was modified as shown in Fig. 2. The motor and generator were both of 20 hp. capacity and geared to the outside shafts. The load was transmitted from test gear *1* through the intermediate cast-iron gear to test gear *2*. With the exception of a few gears of known weaker materials, all the tests were made at a load on the test gears of 780 per cent of normal rating as based on a fiber stress of 5,000 lb. per sq.in., and were run at a pitch-line speed of 2,000 ft. per minute.

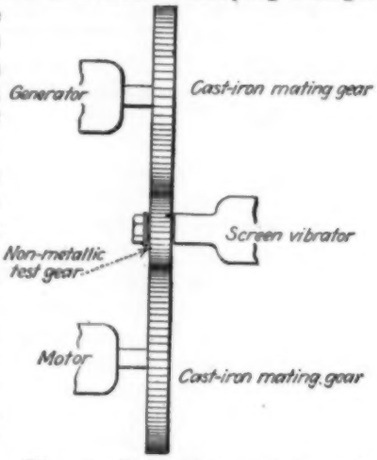


Fig. 3—Vibration and impact gear test set

It was soon observed that when testing gears of the same material, test gear *1* would invariably be the first to fail. It is very evident that it transmits somewhat greater load than gear *2*, since it is the driving gear and has to care for the additional bearing and tooth friction losses of the moving parts. Calculating the power input to the motor and power output of the generator and taking into consideration the losses of the two machines, it was found that a difference of approximately 2 hp. existed. The test gear on position *1* would therefore carry approximately 800 per cent and that on position *2*, 750 per cent of normal rating.

About this time it was decided to develop, if possible, a non-metallic material having higher mechanical strength than the Micarta under test. After a considerable amount of research, a promising material was developed that was approximately 25 per cent stronger in tensile, compression, and transverse bending strength but considerably weaker in impact strength. It was also somewhat harder and could be machined to a smoother surface. Quite a number of tests were made on the set just described comparing the endurance and wearing qualities of this mechanically stronger material, and from the standpoint of wear it appeared

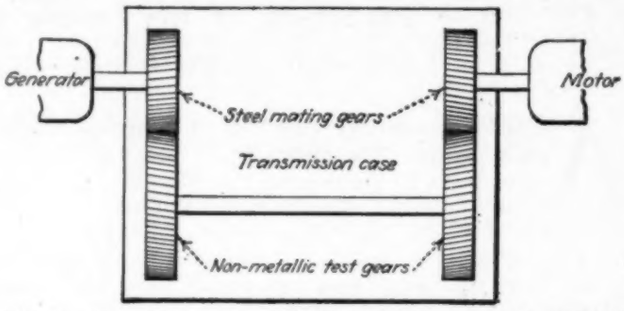


Fig. 4—Gear test set with helical gears run in hot oil

slightly superior, while from the standpoint of endurance it was about equal to the standard material. These deductions were made on average results.

A material that would stand up under such excessive load conditions as mentioned above would presumably give satisfactory service when operated under normal load in actual service conditions. To check this assumption, a number of gears made of the mechanically stronger material were installed, mostly as motor pinions on various machine tools throughout the shop. It soon developed that the gears of the stronger material were not standing up as well as the standard Micarta in actual service. With this in mind efforts were next directed to producing more nearly actual service conditions of a sufficiently severe nature to reduce to a reasonable figure the time required for the test. The conditions met in average service which were not present in the continuous and steady load test just described are vibration, impact and to a certain extent worn and misaligned mating gears.

It was thought that the vibrations resulting from normal operation of many machine tools or other types of machines and transmitted to the gear teeth had considerable influence on the durability of the gear. A testing set as shown in Fig. 3 was then devised. The test gear having a bronze hub was mounted with a running fit on a fixed shaft, which was in turn rigidly attached to the screen shaker, a device used for vibrating ore screens and producing a violent mechanical vibration. The test gear was meshed with two cast-iron gears on the motor and generator shafts, respectively. In the trial run, it was found that the severe vibrations were more detrimental to the electrical machines than to the gear, the generator developing a short circuit in the field coil after a few hours.

The vibration test set was then modified to provide an intermittent impact load on the test gear. The vibrator was replaced by a shaft mounted in two bearings and having rigidly attached to it between these bearings the brake wheel of a magnetic crane brake. By operating the brake about twenty times per minute the retarding action of the brake was carried directly by the gear teeth. Again, in this case the test was more

detrimental to the brake lining than to the test gear.

Of course, some of the difficulties encountered in both the vibration and impact test sets could undoubtedly have been overcome, but from observations made in the limited experience with both tests the utility of the test was rather questionable. Especially in the case of the impact test, the impacts were not sudden enough, being rather in the nature of periodic sudden increases and decreases in the load rather than of shock. Although no results nor data were obtained from the above vibration and impact load tests, still it was an attempt to duplicate in a test the vibration and impact loads which are found in many cases in actual service.

Test Run in Hot Oil

Paralleling the foregoing tests, tests were made on helical gears run in hot oil, which is the condition that exists in automobile timing gear service. The primary object of this test was to determine whether there would be any tendency for the material to open between laminations or swell when operated in hot oil. In making these tests, equipment as shown in Fig. 4 was used.

A motor and generator again provided the power and load. The gears were mounted in an automobile transmission case which was filled with automobile engine oil entirely submerging the gears. The oil was heated to approximately 100 deg. C. by means of an electric heater mounted on the under side of the cover of the case. The gears were operated at a pitch-line speed of 950 ft. per min. and at a 200 per cent load based on a fiber stress of 5,000 lb. per sq.in. Each test run was of several hundred hours duration and in no case did a gear strip or open between laminations.

Service and Engine Test Runs

At the present time an automobile engine is used to make short test runs of timing gears. The tooth wear and any change in face width or diameter are carefully noted. The timing gear train is of the four-gear type in which the non-metallic test gear is in the idler position, thus mating with each of the three metal gears. The engine is run at a certain critical speed where the vibration is quite severe. A test run is usually of 100 hours duration, after which the gear is removed and measurements and observations taken. A test of this kind merely gives an indication of what may be expected in further service. In connection with the timing gear service, actual service tests are also made by installing Micarta gears on various makes of cars. For this service the question of wear and quiet operation is of more concern than tooth strength, since in most cases the proportions of the gear are ample to carry safely the required load.

A few other kinds of tests were conducted, including an attempt to devise a means of measuring and recording the sound or noise produced by a pair of gears in operation. This is quite an involved problem requiring for solution a considerable amount of study and research. Static tooth load deflection tests were also conducted. A fixture was constructed so that the gear could be held in the test machine and the load applied to the tooth at the pitch line in a direction coincident with the line of contact of the tooth, using the standard 14½ deg. pressure angle. The deflection at the end of the tooth was measured by means of a lever arm and dial gage attachment. The maximum fiber stress or modulus of rupture of the tooth agree rather closely with the maximum fiber stress obtained in the transverse or bending strength tests which are made on a specimen ½x½ in. in cross-section and 4 in. between supports.

Conclusions

Although the objects as outlined in the beginning of the story were not entirely attained, yet much information was procured from which valuable deductions can be made respecting the durability, operating conditions, and relative merits of the common non-metallic gearing materials in use at the present time.

Wearing Qualities.—The first test described, that in which only one non-metallic test gear with its metal mating gear were tested at one time, gave an excellent indication of the relative wearing qualities of the three chief kinds of non-metallic materials, as already explained. It also showed that the helix angle of a helical gear, for best wearing conditions, should not be greater than required to just give continuous tooth contact.

Effect of Speed.—The results obtained from the tests run on the motor and generator set shown in Fig. 2 lead to the following deductions: The loss in strength from speed, due to irregularities in tooth form and spacing, is not nearly so great as provided for in the Lewis formula for strength of gears. The non-metallic materials, having a low modulus of elasticity and certain of them even a somewhat plastic nature, absorb the shocks and reduce the increment loads caused by irregularities of tooth form and spacing. Gears of such materials can therefore be operated at high speeds with much less chance of failure from the stresses set up by these increment loads. This factor should be taken into consideration and proper allowance made when calculating the strength of gears, particularly for use at high pitch-line speeds. At the present time it is not possible to give definite figures for modifying this speed factor for Micarta, but such figures should be available in the near future.

Relation of Mechanical Strength Properties to Gearing Requirements.—For most of the compressed type of non-metallic materials the high compressive stress at the point of tooth contact is a greater factor in determining the allowable load than the possibility of fracture. In the test case mentioned above, 660 lb. per inch of face would undoubtedly cause deformation of the tooth profile and very rapid wearing, even though the tooth would not fracture. Because of the greater compressive strength, hardness, and more nearly perfect elasticity of the self-sustaining composite material, these deformations do not occur for any load less than the load required to fracture.

After studying the various mechanical strength properties of a non-metallic gearing material and applying them to average demands required of a good gearing material, it seems that probably the order of importance would be as follows: (1) Impact strength, that is, ability to withstand the shocks resulting from the operating conditions met in many classes of service. (2) Hardness and compressive strength to prevent deformations and rapid wearing. (3) Transverse or bending strength to prevent fracture of the tooth. The compressive and bending strength of the laminated phenolic condensation materials are closely associated, so that good strength in one anticipates good strength in the other. (4) For automobile timing gear service, low thermal expansion and resistance to any deleterious effects of hot oil.

Leveling Turret and Engine Lathes

By K. H. Crumrine

WHILE it is doubtless a fact that very few turret or engine lathes are installed without some attempt at leveling, it is probably as true that only a very small proportion are really properly leveled.

Although it is desirable that a lathe of any type be set level, both laterally and longitudinally, it is not strictly essential that this condition exist for performing the usual run of operations, even though the machine is installed for the most accurate work. It is, however, essential that, to do accurate work, a lathe must be set up so that there shall be no twist or wind in the bed, or in other words, that it shall be made to stand under conditions as nearly as possible identical with those under which it stood when at the maker's factory, where its bed was scraped, its spindle aligned, and, if a turret lathe, its turret bored.

Contrary to the usual opinion, the most careful leveling of the bed of a lathe will not necessarily produce the above conditions, although a skillful workman may approach them more or less closely by this method. It will be found, however, to be a very simple matter when the method to be described is carefully followed.

It is the usual practice when boring the holes in the turret of a turret lathe, to first carefully level the bed of the machine, distributing the weight as evenly as possible on the four feet, and then bore the turret from its own spindle, using the same feeding mechanism as when the machine is used later on to produce work. At this time, the turret slide-ways are parallel with the spindle, having been accurately scraped and indicated to assume this position.

As long as the lathe remains in the same condition, or if it be set up at the user's plant so that the conditions are the same, the machine will bore and turn straight; centering, drilling and reaming can be accurately done, and the spindle and turret slide will operate with the minimum of friction.

If, however, due to unevenness of the floor or foundation, a greater portion of the weight of the machine be carried on two diagonally opposite feet, the bed, even though it be apparently level, will be more or less in a twist, the turret holes are likely to be out of line, and more or less unsatisfactory operating conditions are likely to exist in the spindle bearings and turret slideways. Since the center lines of the spindle and turret holes are a greater distance from the bed of the machine than any other of the essential working parts, and since these two were necessarily in line when the machine was made, it is evident that any twist or wind in the bed will be most readily apparent in a misalignment of these two parts.

It will also be evident that if the spindle and turret holes be again brought into alignment, but without changing any of the adjustments of the machine, the bed will be as nearly without strains, and the weight will be as evenly distributed on the four feet as when the machine was assembled at the maker's plant. In other words, the alignment of the spindle and turret holes is a magnified indicator of the condition of the bed, and the way the weight of the machine is distributed. An error in the bed which cannot be detected with an ordinary spirit level, is readily apparent in the misalignment of the turret holes and spindle.

When installing a turret lathe, it is better to first level the bed, both laterally and longitudinally, with an ordinary level. It is not the purpose of this article to specify types of foundation of methods of adjusting to level position. These are common knowledge among millwrights. Needless to say, however, the firmer the foundation the better the results obtained.

After the machine has been leveled as accurately as possible by this method, the alignment of the turret holes should be tested. This can best be done by holding an indicator in the collet or chuck and rotating the spindle. The point of the indicator may be caused to rotate in the bore of the turret hole, or about an accurately ground, full size plug held in the turret hole. When making this test, it is well to make sure that the turret locking-pin is firmly seated and the turret properly clamped. If the turret hole is found to be out of line toward the front, it is an indication that a greater portion of the weight of the machine is being supported by the left front and right rear legs, and the error can be corrected by shimming or adjusting upward either the left rear or the right front leg. If the turret hole is out of line toward the rear, it is evident that a greater portion of the weight is being carried on the right front and left rear legs and the error can be corrected by adjusting upward, either the left front or the right rear leg.

The principle of the above method of alignment is as applicable to engine lathes as turret lathes, but since a lateral adjustment of the tailstock is always provided, so that the usual errors of installation can be compensated for on work done between centers, this is not usually thought of. However, an engine lathe incorrectly installed will not turn or bore a piece of work held in the chuck and unsupported at the outer end, perfectly straight.

When making a test with work held in the chuck, take a very light finishing cut with a sharp tool, making sure that the tool sets exactly on the center vertically. If, after taking such a cut, the piece measures small at the end away from the chuck, it is an indication that the greater portion of the weight of the machine is being supported by the left front and right rear legs, and the error can be corrected by adjusting upward either the right front or the left rear leg. If the piece is smallest near the chuck, the opposite is true and the error can be corrected by adjusting upward the right rear or the left front leg.

When boring, if the hole be found largest next to the chuck, the conditions are the same as though the piece were turned large at that end, and the remedy is the same.

What Are the Eye Hazards?

What are the chief eye hazards in industry? Briefly, they are as follows: First, the accident hazards, such as flying chips of metal, minerals, and wood; splashing liquids, such as molten metals, acids, and other injurious chemicals; and explosions of all varieties. Then there are the hazards of infections and of eye diseases which arise from neglect of eye injuries, incompetent first-aid treatment, contact with carriers of contagious disease, and exposure to excessive radiated heat. Finally, there is eye strain resulting from improper or inadequate lighting, improper vocational placement, and from ignorance of or disregard for the existence of defective vision.

Fig. 1—Interior of spring shop showing drawing ovens.

Making Springs for Motor Vehicles

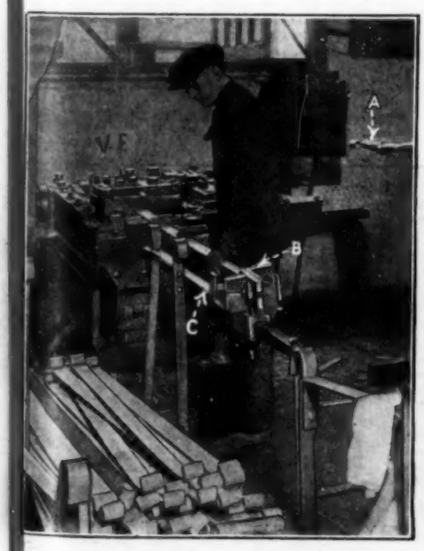
By Fred H. Colvin
Editor, *American Machinist*

Testing the steel and finding the best heat treatment for it—Methods of forming eyes and bending curves —Assembling and testing springs for deflection

THE making of springs for motor vehicles involves a number of operations, although comparatively few of them can be classed under the head of machining, in the usual sense. The operations include forging, bending, and tempering, in addition to drilling, reaming and grinding.

An idea of the general appearance of a spring plant can be had from Fig. 1, which shows continuous heating furnaces at the left, Brinell testing devices at the right, and springs in various stages of manufacture in the foreground. It also shows the kind of racks or carriers used in handling the springs in batches, while the atmosphere shows why it is difficult to secure snappy photographs for illustration purposes.

But before the actual work of making the springs begins, the metallurgical department gets to work as soon as the raw steel has been received at the unloading pit. Here a thorough inspection is made for such physical defects as seams, pipes, etc., and samples are cut from each heat of steel for analysis and experi-



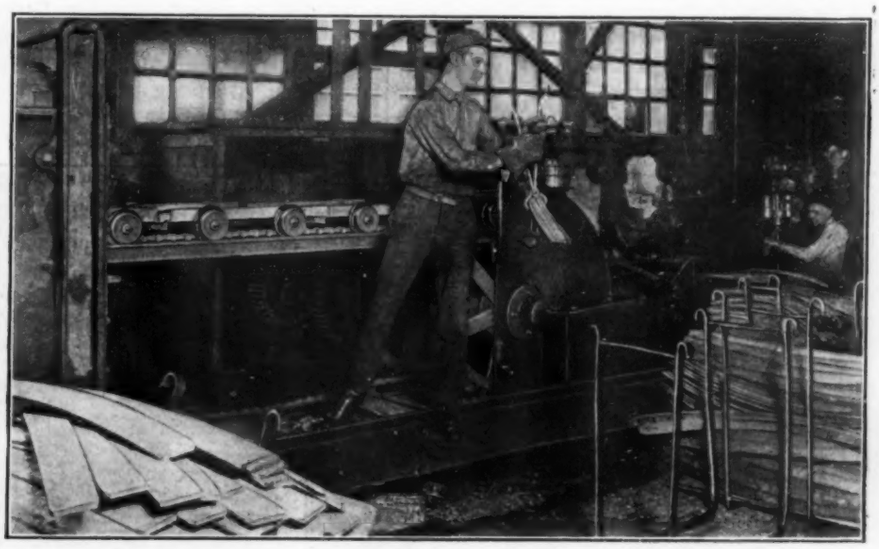


Fig. 2—Bending the eyes. Fig. 3—Removing Work from the drawing oven

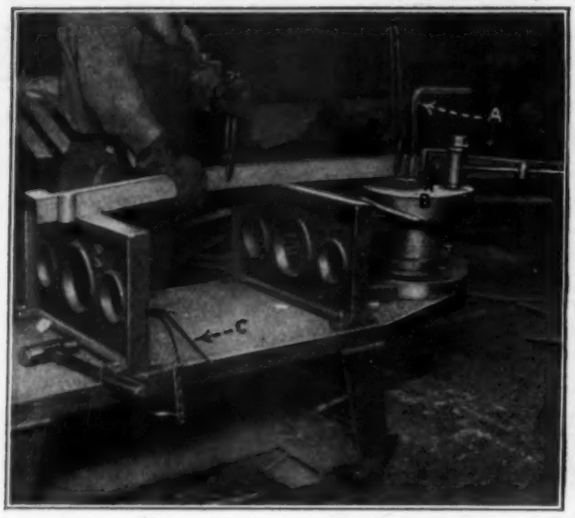


Fig. 4—Turning the ends of upper leaves. Fig. 5—Grinding bushings to length

mental treatment. These samples are sent to the laboratory for test, the number of samples cut depending entirely on the size of the heat, or lot of steel.

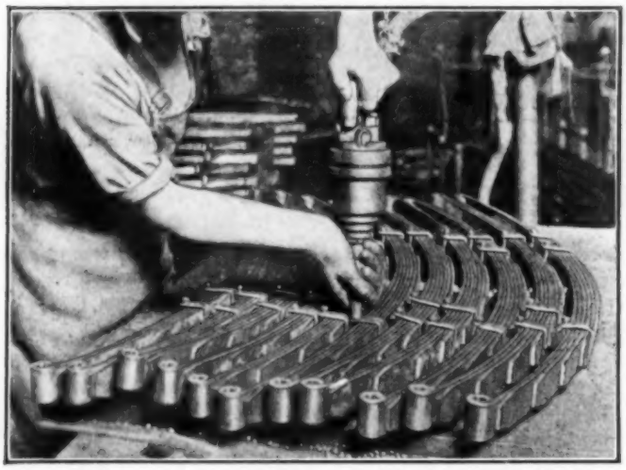


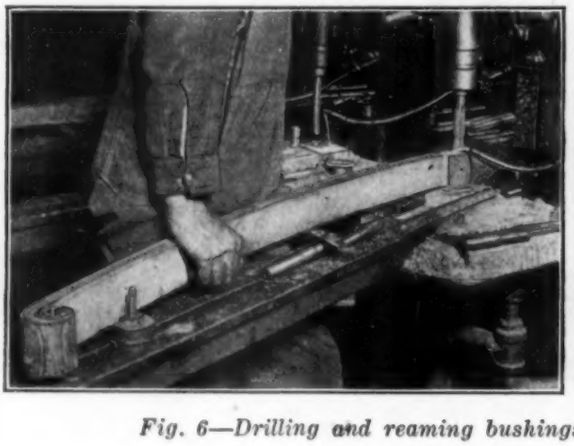
Fig. 8—Fastening the spring clips

A chemical analysis is then made, and, if the steel conforms to the specifications, experiments are conducted in the laboratory as to the best heat treatment. With data thus secured, the correct drawing temperature of the steel is determined and checked. The particular samples heat treated in this manner are broken and carefully examined, after which they are filed for reference. In this way, every heat of steel entering into production is thoroughly tested and recorded, both for checking any complaints which may arise and as a guide for future work.

There is rather an elaborate system of heat cards on which the number of each batch is recorded and the date when it was placed in production. These cards also give the correct drawing temperature for each lot of springs, and this information goes to the ovens where the temper is drawn, so as to be available when the springs made from that heat number reach this furnace.

The temperature of the various fires and quenching baths is controlled by a recording pyrometer system. Men are appointed to take care of the furnaces, and it is their sole duty to see that the temperatures specified for the steel being handled, are kept in each furnace at all times.

In order to insure accuracy, the metallurgical department checks each furnace with an optical pyrometer several times each day. Thus a constant control is kept over the furnaces, and the furnace operators are constantly on the alert. The pyrometer control of the continuous drawing ovens consists of seven thermocouples, one in each of the sections shown in Fig. 1, and in this way uniform heat is insured as the springs



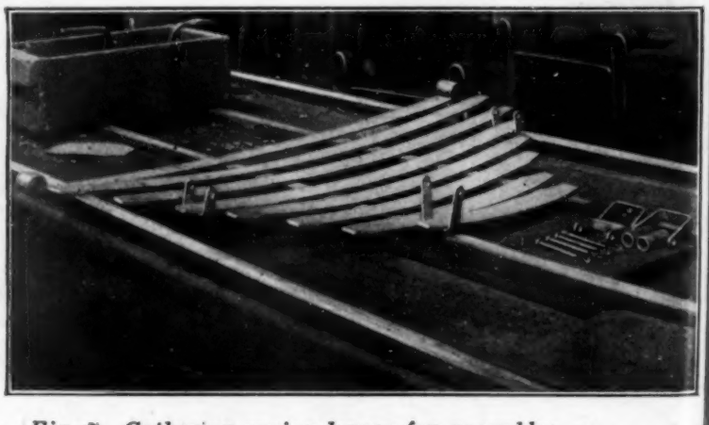
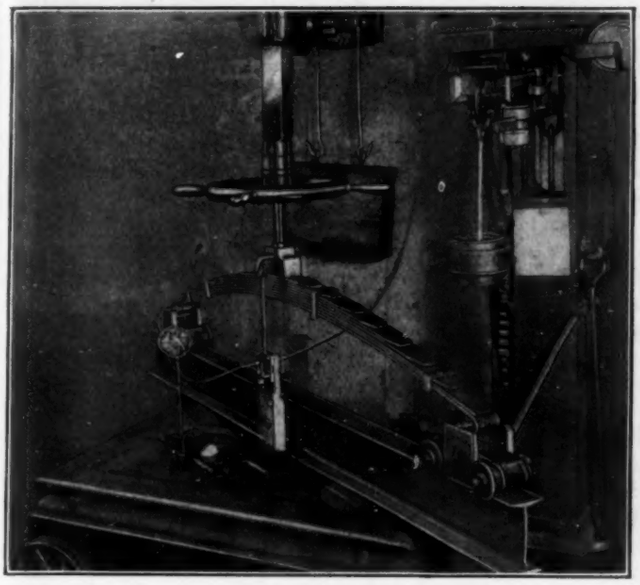


Fig. 6—Drilling and reaming bushings. Fig. 7—Gathering spring leaves for assembly



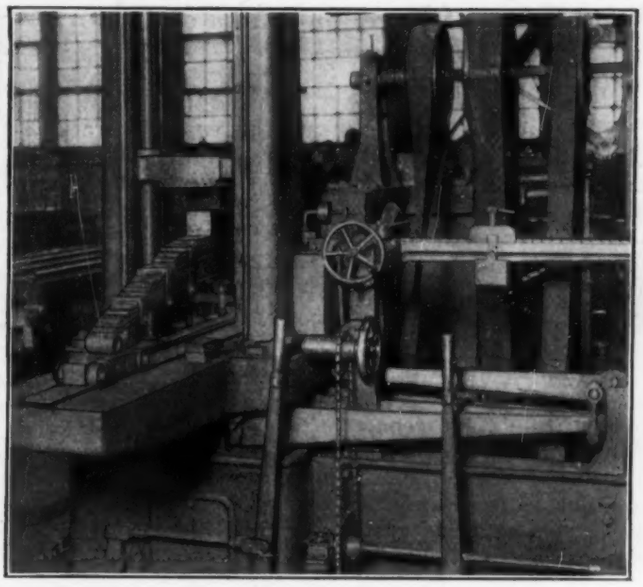


Fig. 9—Shop testing machine for springs. Fig. 10—Testing machine used in physical laboratory

pass through the furnace. Every effort is made to secure uniformity of product.

One of the first operations in the making of the main leaf of a spring is to roll the eyes on the end. There are several different methods of doing this, some of which require two operations, while in others the eye is rolled at one stroke of the machine. One of the eye-bending machines is shown in Fig. 2, the heating furnace being located at the right, as indicated by the cold ends of the springs shown at *A*. The other ends are being heated for bending. The length of the springs between the eyes is controlled by the stop *B*, which can be adjusted on the rail *C*, according to the demands of the work.

The springs are then bent to the desired curvature in specially built machines. The leaves are heated in a convenient furnace and placed in the machine one at a time. The bending is done on forms which are closed and immersed in oil. The leaves are then removed and allowed to cool in the air. This is continued until the required number of leaves have been made.

In Fig. 3 is shown a close view of the discharge end of the continuous drawing ovens, in which the leaves are placed after being taken from the fitting machines. The small cars shown move continuously through the heat of the drawing furnace, the speed of the carriers being timed so as to give the exact amount of heat desired and to have the spring leaves in proper condition when they come out.

Where springs are not made in sufficient quantities to warrant setting up the bending machines, they are made by men who are thoroughly skilled in the work. In this process, after the main leaf has been bent on a form to the curvature called for by the specification, it is used as a basis for shaping the other leaves until the complete spring has been formed.

On some types of springs, the second leaf is practically as long as the first, and has the ends bent over so as to wrap around the eye in the first leaf sufficiently to hold it in place. The method of bending the ends is shown in Fig. 4. Here the first leaf has been laid on the two supports shown and the eye located by the rod *A*, in the center of a swinging head. The second leaf, heated at the ends, is placed over the first and clamped by tongs. An operator grips the hot end of the second leaf in the clamp *B*, and swings the piece around, which draws the end around the eye of the first leaf, fitting it very closely. This view shows the method of holding the tongs in their clamping position, a pair being shown at *C*.

Bushings are then inserted in the eyes of the spring and the end ground to width, using a double head grinding machine as shown in Fig. 5. The spring rests on the slide at *A*, which enables the leaf to be easily moved forward, so as to bring the bushing between the grinding wheels. It will be noted that this spring has already been built up to three leaves.

The bushings are then drilled and reamed, as shown in Fig. 6, a very simple fixture being provided for holding them during this operation.

The method of assembling the springs is shown in Figs. 7 and 8, Fig. 7 showing the parts gathered for assembly, some of the clips being shown in place. This view shows the construction of the assembling bench which, by having the raised portions on which the springs rest, enables them to be easily and quickly handled in the assembling.

The springs move along the assembly table continuously. The center bolts are inserted, the bolts put in the spring clips, the nuts screwed in place and the ends clipped off. Fig. 8 shows a nut being screwed in place with a small pneumatic tool provided with a friction clutch, which slips when sufficient tension has been applied to the bolt.

The action of every spring is tested before leaving the assembling department. The types of testing machines used are shown in Figs. 9 and 10. The location of the spring to be tested is clearly indicated on the platforms. In these machines, the spring is deflected and examined to find out if it properly meets the requirements of the specifications as to load and height.

Some idea of the variety of springs manufactured in the plant of the Sheldon Axle & Spring Co., Wilkes-Barre, Pa., may be had from the fact that the product includes springs for passenger vehicles of many grades, up to and including Rolls-Royce cars, and also about everything in the motor truck field, as well as a large number of springs for animal drawn vehicles.

The Value of Foreign Travel of Export Managers

By J. D. Mooney

THE problem of management of an export operation, if it is to be carried to a high state of development, is a more difficult one than a domestic marketing problem.

The export operation combines all of the usual functions common to the domestic marketing operation with other functions, such as, export packing, additional transportation problems, foreign financing and customs duties. It deals with a widely spread market, the characteristics of which in customs, languages, psychology, laid down cost of the product, competition, risks, and possible rate of development vary to a greater extent than in the domestic field.

The more complicated the problem, the greater is the need for accurate information and a correct sense of the market as a background for decisions, the development of policies and sales effort, and of the development of the domestic machine for handling the business created. The complicated nature of the export problem coupled with the great distances involved intensify the difficulties of control, making it necessary for the export manager to be more careful, and spend more of his time on this background than his contemporary operating in the domestic field.

To a certain extent this background can be supplied through correspondence, and through reports from the fieldman. This source has three handicaps. The first handicap is that the fieldman in powers of reasoning and analysis is not as well developed as the manager. Over any group of fieldmen there undoubtedly is a considerable variance in these qualities constituting a handicap in that class of information which must be considered in a comparative sense from different sections of the total market.

The Narrowing Viewpoint

The second handicap lies in the fact that any fieldman operating for a considerable period in one section of the market is bound to become innoculated with the atmosphere of that market and with the point of view of those around him to an extent that effects appreciably the information and analyses he sends in. He rarely has the opportunity to stand off at a distance from his work and develop his perspective, he is so deeply involved in his section of the general problem that its own peculiar condition and need takes on in his mind a weight disproportionate to its true value in the general picture.

The third handicap lies in the principle that a sense of the problem, especially in its fine points, can only be properly developed by one who is making a close study of the problem. The fieldman does not understand the manager's problem, and the methods of solution he is working out as clearly as the manager does himself. He is very busy with the day's work and cannot be expected to make a study of management. It follows that he is thereby handicapped as a source.

In all the phases of the management problem that cannot be covered by cold data obtained from the field, the manager is dependent upon the reactions he receives from correspondence, from fieldmen, and other contacts, which are subject to the foregoing limitations, plus the manager's own observations. Experience shows that a very high percentage of the manager's problems fall within this latter class, and, furthermore, that the measure of sound success obtained is due largely to a careful study in these strata of the problem. He cannot expect sound progress, then, unless he devotes a reasonable amount of his own effort to first-hand study of his markets.

The amount of time necessary in travel in order to do justice to the principle of covering important sections of world market assumes rather appalling proportions at first glance, but over a period of years it is balanced by the greater efficiency developed. Matters of importance, in important market sections, that otherwise drag out by correspondence for months and years handicapping progress, are settled on the ground. The clear picture he builds up in the course of his visits and his personal knowledge of individuals involved enables him to accomplish more and surer work when he is in his own office.

In the general reactions against this travel time he needs to consider that the same steamers that are to carry him back and forth, also carry the mails. With the same time intervals for transmitting the information, he can by personal visits collect much more and clearer information than could be put in letters. Letters as conveyors of information are inefficient instruments, unless the recipient can read out of them what was in the mind of the writer from his personal knowledge of the writer's personality and sphere of operations.

Two points concerned in the foregoing are of sufficient importance to justify being brought out in emphasis. An operation such as we are considering does most of its business through a number of principal buyers. It is important that the head of the marketing organization and the heads of the important buying organization know and understand one another.

Also it is very valuable to the export manager to see his own men at work in their respective fields, both as a means of judging the man, his work and influence in the field, and for the good of the manager's own sense of the problem his men are working on. His fieldmen are the fingertips of his marketing sections, and they are located out where the feel of the market first enters this organization. The home office ties the threads of their work together, and handles the business they are building. Too little contact with either branch of the operation results in a distorted sense of proportion which in the management of such an operation is dangerous and expensive.

Excerpt from speech delivered at the Export Managers' Meeting, New York, March 18.

American Autos in Bulgaria

The reason that American cars are not gaining ground in Bulgaria is lack of interest on the part of American exporters, Vice-Consul F. LeRoy Spangler, Sofia, thinks. German, Italian, Austrian and recently French cars are conducting active campaigns and many new cars are to be seen in the streets of Sofia. At present there is little market for American service station equipment or accessories, and a demand could result only from the sale of larger numbers of American motor cars. This would be easily possible if the interest of American manufacturers could be awakened, and there is no reason why American cars cannot compete in price and quality with the foreign makes now being sold there. Many of these makes are unable to compete with American cars in other countries.

Forty Per Cent of the Machine Tools in Electric Railway Shops Are Over Twenty Years Old

Survey by Electric Railway Journal

TO MODERNIZE electric railway shops in the United States, 12,500 new machine tools, including woodworking machines, are needed as a minimum. This is based on the assumption that at the very least all machine tools over 20 years old ought to be replaced. The number of such tools in the shops of the 821 electric railway operating companies is about 10,000, which is 40 per cent of the total number of machine tools of all ages in use in the industry. In addition, 2,500 more new machine tools are required to meet the expressed need of the master mechanics for new tools to supplement their present equipment.

This is believed to be a conservative estimate, because many machines less than 20 years old ought to be replaced too, and because many more new additional machine tools are needed than 2,500, as this number is based on a literal interpretation of the fact that no information on this point was supplied by 53 per cent of the master mechanics reporting.

Such a program as this of new machine tools would require expenditures aggregating some $15,000,000 to $20,000,000, which indicates the magnitude of the task that must be accomplished in modernizing the rolling stock maintenance facilities of the industry. As it is generally conceded that substantial economies are readily possible and would result from such a program, one may get an idea from the figures just read of the magnitude of the savings that are available. Or, to put it another way, one gets some appreciation of the losses which electric railways are suffering by continuing the use of the present obsolete, inefficient and small capacity machine tools.

Having known for a long time, but in a general way, that electric railway shops are very poorly equipped on the average, the JOURNAL undertook for this Annual Maintenance Number to derive a definite measure of how well or how poorly the shops actually are equipped. Information was gathered in from 62 properties in all parts of the country and of all sizes, the aim having been to include data from 25 companies in each of three classes: Class I, 5 to 50 cars; Class II, 100 to 300 cars, and Class III, 400 cars up. These data are summarized in the accompanying tables. With the actual data covering the 62 properties of all three classes as the basis, the total figures for the industry were roughly estimated.

The tables are self-explanatory so far as the data there are concerned. But it is by noting the blank spaces and the smallness of the figures opposite the items for some of the companies that one is able to discern to what extent the companies are equipped as to machine tools. The vertical columns show what the individual companies have and what they lack; the horizontal rows give a comparison among the several companies as to the extent of use of each type of machine tool equipment.

These first three tables do not take into account the suitability of the tools shown to be in use. A better idea of this is obtained by noting how long ago the present machines were manufactured. From the data collected from the 62 railways the date of manufacture is known for about 1,000 of the machines. Of these, but 14.2 per cent were purchased since 1920; 14 per cent are from 5 to 10 years old; 20.5 per cent are from 10 to 15 years old; 22.3 per cent are from 20 to 25 years old, and 18 per cent are more than 25 years old.

Some would claim that a machine tool that is more than 10 years old cannot be considered as of modern design. On that basis it might be said that more than two-thirds of the present machine tool equipment in electric railway shops could be replaced to the advantage of the railways.

The data collected also included a statement from the master mechanics as to tools that should be added to their present equipment in order that their maintenance work could be done efficiently. Thirty railways showed that they needed 191 new machine tools, as

Table I—Classification of Machine and Woodworking Tools in Seventeen Electric Railway Shops Maintaining from Twelve to Fifty Passenger Cars

Number passenger cars	12	15	16	22	24	25	26	37	39	42	43	44	46	47	50	50	50
Machine Shop																	
Emery wheel	1	1	1	1	2	1	1	1	2	2	1	2	1	1	3	2	3
Grinding machine		1				1		1			1						1
Grindstone	1	1	1	1	1			1	1	1			1	1	1	1	1
Drill press	1	1	1	1	3	2			2	2		2	1	1	2	4	3
Radial drill							1								1		
Wheel turning lathe				N	1	1	N	N		1				1	1	1	1
Heavy turret lathe																	2
Low swing axle lathe								N							1		1
Other lathes	1	1	2	1	2	2	1	1	2	2	4	2	3	1	3	2	3
Milling machine															1		
Shaper	N	1		1	1	1	1		1	1	1	1	1	1	1	1	2
Power hack saw	1	1	1	N	1	1	1		1	1	1	1	1	1	1	1	1
Planer			1		1	1			N			1					1
Punch press													1				1
Heavy duty punch and shear					N					1							
Horizontal boring mill										1					1		
Vertical boring mill					1		N	N			1				1		
Wheel press	1		1	N	1		N	N	1	1	1	1	1		1	1	1
Pipe cut. and thread. mach.				N	1			N	1	1							
Axle straightener								N		N	1						1
Bolt cutter						1	1	N		1	1	2	1	N	1	1	1
Key seat cutter								N									
Woodworking Shop																	
Band saw	1				1	1	1		1	1	1		1	1	1	1	1
Universal table saw					1	N	1						N		1	1	1
Wood planer					1	1	1			1	1		N	1	1	1	1
Double spindle planer											1				1		
Wood lathe					1		1			1					1	1	
Vertical mortiser					N				N	1			N		1	1	
Horizontal mortiser										1					1		
Rip and cut-off saws			1			1			1	1	1			1	2	1	
Resaw													N				
Shaper											1				1	1	
Power sander											1				1		
Joiner					N				1						1	1	1
Sticker																1	
Tenoner															1		
Saw filer and setter										1	1				1		1
Molding machine																	
Glass cutting machine											1						

Note: N means additional tools needed to do maintenance work efficiently, as indicated by master mechanics.

Table II—Classification of Machine and Woodworking Tools in Twenty Electric Railway Shops Maintaining from 114 to 277 Passenger Cars

No. passenger cars	114	123	126	126	132	137	140	146	146	150	175	182	189	191	218	218	230	232	276	277
Machine Shop																				
Emery wheels	2	2	2	2	2	2	2	2	2	4	2	4	1	2	2	2	8	2	3	1
Grinding machine	..	..	..	..	..	..	..	..	..	1	1	1	..	..	1	..	..	..	1	..
Grindstone	1	..	1	1	..	1	..	1	1	..	2	..	..	1	..	..	3	1	..	1
Drill press	3	1	1	3	3	2	2	3	3	3	4	3	2	3	2	2	4	2	3	4
Radial drill	..	1	1	..	N	1	1	..	..	..	1	..	1	..	..	N	..	..	1	..
Wheel turning lathe	N	..	1	..	1	..	1	1	..	..	2	1	1	..	1	1	..	..	1	..
Heavy turret lathe	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	3	..
Hand screw machine	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Low swing axle lathe	..	..	..	1	1	..	..	1	..	2	1	1	..	..	N	..	1	..	..	..
Other lathes	2	2	2	2	4	4	3	3	2	1	4	2	3	7	3	3	2	3	5	2
Milling machine	N	..	1	..	N	..	..	..	N	..	..	1	..	..	..	N	1	..	2	..
Shaper	1	1	1	1	1	1	1	1	..	1	2	1	1	1	1	1	1	1	1	1
Power hack saw	1	..	1	1	2	1	N	2	1	1	2	1	1	1	1	1	1	2	1	1
Planer	..	..	..	..	..	1	..	1	..	1	1	..	..	..	..	1	1	..	1	..
Punch press	..	..	..	..	N	..	..	..	..	..	1	..	..	..	N	..	..	..	1	..
Heavy duty punch and shears	..	..	..	..	..	1	..	..	..	..	..	1	N	..	..	..	..	..	..	1
Horizontal boring mill	..	1	..	..	..	..	..	1	1	..	..	1	..	..	..	1	1	..	..	..
Vertical boring mill	1	..	1	1	1	1	1	1	..	1	2	2	1	1	1	..	..	1	2	1
Wheel press	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pipe cutting and threading machine	1	..	1	..	..	1	1	..	..	..	1	1	1	..	1	1	..	..	1	1
Axle straightener	1	..	N	..	1	..	..	..	..	1	1	1	..	1	..	..	1	..	..	1
Bolt cutter	1	1	1	N	1	..	..	..	1	..	1	1	..	1	1	..	1	1	1	1
Hydraulic press	1	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	1	1	..	..
Key seat cutter	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wheel grinder	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Bearing boring machine	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Woodworking Shop																				
Band saw	1	1	1	1	1	1	1	1	1	1	..	1	..	1	1	1	1	1	1	1
Universal table saw	1	..	1	1	1	..	..	..	..	..	..	1	..	..	1	..	..	..	..	1
Wood planer	..	..	1	1	1	..	N	1	1	1	..	1	..	1	1	1	1	1	..	1
Double spindle planer	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Wood lathe	..	1	1	1	1	1	1	1	1	..	..	1	..	..	1	1	..	..	..	1
Vertical mortiser	1	..	1	1	1	1	..	..	1	..	..	1	..	..	1	1	1	1	..	..
Horizontal mortiser	..	..	1	1	..	..	N	1	..	..	..	1	..	..	1	..	..	..	..	..
Swing saw	..	..	..	..	..	..	N	1	..	..	..	1	..	..	1	..	1	..	..	..
Rip and cut-off saws	..	1	1	1	..	1	1	1	1	1	..	..	..	1	1	1	1	1	1	2
Resaw	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..
Shaper	..	..	1	1	..	..	N	..	N	..	..	1	..	..	1	1	1	1	..	1
Power sander	..	..	..	1	..	..	N	..	1	..	..	2	..	..	1	..	2	..	..	2
Joiner	..	..	..	1	1	1	N	..	1	..	..	1	..	..	1	1	..	1	..	..
Sticker	..	1	..	..	..	..	N	..	..	..	..	..	..	..	1	..	..	..	..	..
Tenoner	..	..	1	1	..	..	..	..	..	..	..	1	..	1	1	..	..	..	..	1
Saw gummer	N	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Saw filer and setter	N	..	..	1	1	..	1	..	..	..	..	1	..	..	..	..	1	..	..	..
Universal wood worker	..	..	..	1	..	..	1	..	..	..	..	..	1	..	1	..	1	..	..	..
Molding machine	..	..	1	1	..	..	..	..	..	..	..	..	..	..	1	N	..	..	..	1
Post borer	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	N	..	..	..	..

Note: N means additional tools needed to do maintenance work efficiently, as indicated by master mechanics.

Table III—Classification of Machine and Woodworking Tools in Nineteen Electric Railway Shops Maintaining 400 Passenger Cars and Up

Number of passenger cars	400	407	409	410	416	438	445	500	600	629	653	738	755	807	1,030	1,398	1,466	1,500	2,343
Machine Shop																			
Emery wheels	5	2	3	3	2	1	4	4	6	1	2	5	5	2	7	10	1	9	2
Surface grinder	..	..	..	..	..	N	..	..	..	..	..	3	..	1	4	..	..	..	1
Grinding machine	1	2	1	..	1	..	N	1	3	..	1	2	3	2	3	5	3	4	1
Grindstone	..	1	1	1	2	1	..	..	..	..	..	1	..	1	..	2	1	1	2
Drill press	4	3	4	3	6	3	5	6	11	4	1	16	8	4	14	17	3	10	8
Radial drill	2	1	..	1	3	N	1	2	1	..	..	2	1	1	3	..	..	1	2
Wheel turning lathe	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	..	1	1	1
Heavy turret lathe	..	..	..	..	..	..	..	..	3	..	1	4	1	2	8	..	..	1	1
Hand screw machine	..	..	..	..	..	..	..	..	..	..	..	1	2	..	1	1	..	..	..
Low swing axle lathe	..	N	..	..	1	..	..	..	1	1	1	2	..	1	2	1	..	1	1
Other lathes	6	4	5	3	10	4	4	5	3	3	1	7	8	4	11	21	6	5	8
Milling machine	2	N	..	..	..	N	1	..	1	1	1	4	2	1	7	4	..	2	3
Shaper	2	1	1	1	2	2	2	2	2	2	1	5	3	1	1	3	1	2	2
Power hack saw	..	1	2	1	..	1	1	3	1	1	1	5	2	2	2	1	2	1	1
Planer	1	1	1	1	2	1	1	3	3	..	1	3	3	1	5	4	1	1	1
Punch press	1	..	1	..	..	..	1	1	1	..	..	2	N	2	1	4	..	1	1
Heavy-duty punch and shears	..	..	..	..	1	..	..	..	..	..	..	2	..	1	..	..	..	1	1
Horizontal boring mill	1	1	..	..	..	..	..	..	..	1	..	..	1	1	2	1	..	1	2
Vertical boring mill	1	1	1	1	1	N	1	1	1	1	2	2	2	2	3	3	1	2	3
Wheel press	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2
Pipe cutting and threading machine	..	1	1	1	2	..	1	..	..	1	1	2	1	1	3	..	..	1	1
Axle straightener	1	1	..	1	1	1	1	1	..	..	..	1	1	1	1	1	1	..	2
Bolt cutter	1	1	..	1	2	1	..	2	1	..	..	3	..	2	2	3	1	1	1
Broaching press	1	N	..	..	..	N	..	..	..	..	..	..	..	..	2	1	..	..	1
Key seat cutter	..	N	..	..	..	..	..	..	..	..	..	1	1	..	1	1	..	1	..
Wheel grinder	..	..	..	..	..	..	1	1	..	..	..	..	1	1	..	2	..	..	..
Metal cutting saw	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	1
Hydraulic press	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..
Gear cutters	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..
Tapping machine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..
Woodworking Shop																			
Band saw	2	1	1	1	3	1	2	2	3	1	1	3	2	2	2	4	2	2	2
Universal table saw	..	1	..	1	1	N	1	..	1	1	..	1	1	2	1	1	1	3	1
Wood planer	1	1	1	2	1	..	1	1	2	1	1	3	1	3	2	2	..	..	1
Double spindle planer	..	..	..	1	1	1	..	..	..	..	..	..	1	1	..	2	..	1	1
Wood lathe	2	1	1	1	1	1	1	1	1	..	1	3	2	1	2	2	3	1	1
Vertical mortiser	2	..	..	1	1	1	1	2	1	1	1	1	1	1	..	2	1	1	2
Horizontal mortiser	..	1	1	1	1	..	..	..	1	..	..	1	1	1	2	2	..	..	2
Jig saw	1	..	1	1	..	..	..	..	..	..	..	1	1	1	..	1	..	..	1
Swing saw	1	1	..	1	..	N	1	1	1	..	1	1	1	2	1	1	1	1	1
Rip and cut-off saws	1	1	2	1	3	1	N	2	..	..	..	2	3	3	5	5	..	..	3
Resaw	..	1	..	1	..	..	..	..	..	..	1	..	..	1	1	1	..	..	..
Shaper	1	1	2	1	1	N	1	1	1	1	1	1	1	1	1	5	1	1	2
Power sander	1	1	..	1	2	..	N	1	1	..	1	4	3	1	2	1	1	2	1
Joiner	1	1	1	1	2	2	1	1	2	1	..	2	2	1	4	2	1	1	2
Sticker	1	1	1	1	3	N	..	1	1	1	1	2	..	3	1	3	..	..	2
Tenoner	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	3
Saw gummer	..	..	..	1	3	..	..	..	..	..	..	1	1	1	..	1	..	..	..
Saw filer and setter	..	..	1	1	2	1	..	1	..	..	1	1	1	2	..	4	..	1	1
Universal wood worker	..	..	1	1	..	1	..	..	1	..	1	3	1	2	1	3	..	..	..
Power groover	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	2	..	1	..
Molding machine	..	1	..	1	..	..	..	1	2	1	..	2	1	..	1	1	1	1	1
Dovetail machine	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	1	..
Knife grinder	..	1	..	1	..	..	..	..	..	..	..	..	2	..	1	..	..	..	..
Post borer	..	..	1	..	1	..	1	1	..	..	..	1	1	..	..	..	..	3	1

Note: N means additional tools needed to do maintenance work efficiently, as indicated by master mechanics.

listed in Table IV. The other 32 railways included in the study did not indicate the need of any additional tools. Assuming then that 191 is the total of additional machine tools needed by the 62 railways, it is estimated on this basis that the entire industry, if canvassed, would indicate its need for 2,500 additional new machine tools.

The 62 companies show a total of 1,893 machine tools of all types in their present shop equipment. This would indicate a total of approximately 25,000 machine tools in use in the electric railway field.

Of the total of 191 new machines shown to be needed by 30 companies 83 were for the machine shop, 55 for the carpenter shops, 23 for the forge shop, 15 for the armature room and 15 for the sheet metal shops. In the machine shops, particular need was expressed for additional surface grinders, wheel-turning lathes and other lathes, milling machines, axle straighteners and bolt cutters. In the woodworking shops the greatest need appears to be for universal table saws, wood shapers and power sanders. In the forge shops, bulldozers and shears are needed most. Armature rooms need banding lathes and the sheet metal shops need additional power shears.

Table IV—Additional Tools Needed by 30 Electric Railways to Carry On Maintenance Work More Efficiently

Machine Shop	
Emery Wheels	2
Surface Grinder	6
Grinding Machine	2
Grindstone	1
Drill Press	2
Radial Drill	4
Wheel Turning Lathe	7
Heavy Turret Lathe	2
Low Swing Axle Lathe	4
Other Lathes	5
Milling Machine	6
Shaper	2
Power Hack Saw	3
Planer	2
Punch Press	2
Punch and Shears	4
Vertical Boring Mill	4
Wheel Press	4
Pipe Cut. and Thread. Mach.	3
Axle Straightener	5
Bolt Cutter	5
Broaching Press	3
Key Seat Cutter	2
Air Hoist	1
Electric Welder	1
Babbitt Furnace	1
Total	83
Woodworking Shop	
Band Saw	1
Universal Table Saw	6
Wood Planer	4
Double Spindle Planer	2
Wood Lathe	1
Vertical Mortiser	4
Horizontal Mortiser	2
Jig Saw	1
Swing Saw	3
Rip Saw	3
Shaper	5
Power Sander	6
Joiner	2
Sticker	4
Tenoner	2
Saw Gummer	3
Saw Filer and Setter	3
Molding Machine	1
Boring Machine	1
Tool Grinder	1
Total	55
Forge Shop	
Forging Machine	1
Bulldozer	6
Steam Hammer	3
Air Hammer	3
Drop Forge Hammer	3
Punch and Shears	6
Belt Driven Hammer	1
Total	23
Armature Room	
Commutator Grooving Machine	2
Banding Lathe	6
Coil Winding Machines	2
Coil Presses	1
Commutator Lathe	1
Hydraulic Press	3
Total	15
Sheet Metal Shop	
Circle Cutter	2
Turning Machine	1
Setting Down Machine	1
Foot Power Shears	5
Foot Power Punch	1
Foot or Hand Break	2
Scroll Shears	1
Riveting Machine	2
Total	15

A by-product of Tables I, II and III is that they enable one to see just about what machines ought to be included in the equipment of electric railway shops of various sizes.

Iron Ore Beneficiation Studies

At a conference recently held in Birmingham, Ala., between representatives of the Interior Department and a number of blast furnace operators, it was decided that the Southern Experiment Station of the Bureau of Mines, Birmingham-Tuscaloosa, Ala., should investigate the utilization of blast furnace flue dusts. Samples of such dusts have been obtained from a number of companies and experimental work upon them has begun.

Looking Backward

By J. P. Poland

IN ONE way or another I have taken the *American Machinist* since it was first published in 1877. I used to buy it at the newstand in the old Boston and Lowell Railroad station in Boston. I was born in 1853 and am now 70 years old. I have often thought, if the next 70 years sees the advances in mechanics and science that I have witnessed in this, there certainly will be something doing. I first worked in Boston in my father's shop and lived in Arlington, my native town. Those happy, youthful days seem a long way off.

I have seen many changes in the *American Machinist* since the days of Mr. Bailey, the first editor. I have had the pleasure of meeting both Mr. Hill and Mr. Miller, so I feel that the *Machinist* is a very particular and intimate friend, and it has proved so upon more than one occasion, I assure you. I wish to tell how much I have enjoyed the articles by Guy Hubbard. They seem to me not only interesting but very valuable, and naturally to a man of my age there comes, perhaps more than to younger men, the added interest of youthful associations and early friends. I hope Mr. Hubbard has very much more to add to what he has already given us. I am sure I speak for many of the readers of the *Machinist* when I say that, however much more he may have, it will be received with very great pleasure. I know well that old men are shoved to one side and thrown out most ruthlessly, but the young men of today will soon be the old men of tomorrow, and from what I have observed, somewhat sooner. This may be the egotism of an old timer but wait and see.

History of Early Machinists

I have been sometime coming to the meat in my letter, if there is any, but the history of our early machinists, their lives and methods, their privations and hardships, has always been a subject of surpassing interest to me. I have always thought that my native town of Arlington, formerly West Cambridge, had much of interest in a mechanical way, historically as well as nationally.

The Whittemores were one of the early families of the town, and the old Squire, as he was called, had two sons engaged in the manufacture of cards for carding cotton and wool. One of the boys, Amos, was the inventor of the automatic card setting machine. He and his brother first made machines for pricking the holes in the leather, which at that time was the only material used for cards, and all cards at first were hand cards. The pricked pieces of leather were sent to different families in town, together with the bent staples (a machine for making which they, the Whittemore boys, had) and the teeth were set by hand. A machine for taking the wire from a reel, cutting it into lengths, pricking the holes in the leather, inserting the teeth after previously bending them to the form of a staple, and hooking them after passing through the leather, feeding the leather horizontally and vertically before the setting mechanism, was afterwards perfected. The old card factory was directly opposite our home, back of the old cemetery. I have been in it many times and have seen the old shafting, hangers, and pulleys. This was the beginning of what is now that vast industry in both this country and in England—the manufacture of card clothing for carding cotton and wool by automatic

machines. The Whittemore machine was taken to Manchester, England, and much improved. The large card factories in Worcester and Leicester, and other New England towns and cities, must have all sprung from the small shop of the Whittemore boys. I am quite sure the early patent on the Whittemore card setting machine can be found in the Patent Office at Washington.

Mill Brook, which rises in the Great Meadows in Lexington, flows through East Lexington to Arlington and empties into Medford Pond, the head waters of Mystic River, a tidewater river flowing into Boston harbor near the Charlestown Navy Yard—furnished power for many of the early industries of the old town of West Cambridge. Among others in the upper part of the town was the saw factory—the first one, I have always understood, established in this country. It was started by two Englishmen, Welch and Griffiths, and at one time was a large and thriving business employing many men. The Welch and Griffith saws were well and favorably known in all parts of this country—much, if not all, of the steel and steel plates used in their manufacture came from England, as did also a majority of their workmen; and let me tell you they were a live bunch. They received what, in those times, were high wages and they spent them in a lavish manner. I have known them when the mood seized them, to throw down their tools and leave the shops to go out and play cricket—we did not know about baseball in those days.

The salesrooms were in Boston and for many years the firm did a large and lucrative business but for some reason instead of increasing and expanding as many other saw manufacturers (notably the Disstons, Simonds, etc.) have done, they gradually faded away and are now only a memory, and the old shops are either completely dismantled or used for other purposes.

Most of what I have written of course is from memory and you may not be interested or think it suitable for publication. At least it has been a pleasure for me to write it, and I hope will not consume too much of your time to read it and also I hope that you may, yourself, experience the pleasure old men take in "looking backward."

Portugal Presents Automotive Opportunities

With approximately 400 American cars entering Portugal each year, the American type of vehicle is preferred because of its cheapness, attractive design and adaptability, and the facilities for securing spare parts, according to the Automotive Division of the Department of Commerce. Seventy-five per cent of the imports during 1923 came from the United States. According to official statistics, 11,000 automobile trucks and motorcycles are registered in Portugal, but not over 7,000 are actually in use.

American cars are better adapted to the rough roads of the country, but their popularity suffers somewhat on account of higher gasoline consumption. The fact that a number of foreign cars have a large passenger car capacity, despite their small engines and relatively small consumption of gas, continues to make them factors in the market, for the touring habit of the large-size Portuguese families is well developed. American cars built along similar lines could easily sell in the Portugal market. Total business would not be large, but it would help improve the export records.

Motor Shop Problems

What Makes a Gear Noisy?

By Frank C. Hudson

IT IS exasperating that no one seems to know just what makes a gear either noisy or quiet. For there are cases where gears with a tooth form as perfect as can be measured are not as quiet as other gears that have teeth not nearly so perfect.

Concentricity probably plays a big part in gear quietness, lack of it being responsible for many periodic "hums" as the teeth advance and recede with reference to the pitch line of the mating gear. On the other hand, two eccentric gears may run quietly if they are set so as to maintain a uniform relation to each other.

The controversy between advocates of ground teeth and those who are not yet sold on the idea brings out another point. There is no question but that a properly ground tooth has a more correct form than one that has not been corrected after hardening. But those who feel that more depends on the condition of the surface than on its exact shape show cases of quiet running gears where no grinding or correcting of distortion has been attempted.

Burnishing Has Advocates

The "smooth surface" advocates point to quiet running transmission in which the teeth have been burnished, or rolled-in, before hardening, using a hardened master gear with smooth teeth to "iron out" any slight inequalities in the surface. These gears, in spite of slight distortion after hardening, are said to run quietly in nearly all cases.

On the other hand, the gear tooth grinder is making headway among some of the best-known builders and seems to have made a place for itself, even for transmissions on cars of medium price. This year's experience along this line should be very enlightening.

The transmission gear problem is one that bobs up at the slightest provocation. Quiet transmission gears are the goal of nearly all designers and shop men. There are, however, a few hardy souls who ask, "Why bother about such special quietness in low, intermediate and reverse gears? Every car runs 95 per cent of the time with the gears idle so why fuss if they are a bit noisy for a few seconds, or minutes at most?"

But the sales department sings a different tune. For the increasing use of closed cars makes gear noise more noticeable and the sales department makes a lot of noise about the quietness of the gears. So we have gear tooth grinding, and lapping, and polishing, and burnishing or rolling-in. Designers are even considering internal gearing for transmissions because the greater tooth contacts make any old gear practically quiet. But here again the shop end will have its own troubles, when the engineers start to change the whole transmission make up. It might even lead one to regret the good old days when a judicious dose of ground cork in the transmission case oil was a sure (if temporary) cure for noisy gears. Or one might go even farther back to the days when most cars were chain driven. The chains made such an infernal racket that any other kind of noise anywhere in the car was completely covered up.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Suspension Brackets for Jig Plates

BY W. F. SANDMANN

The suspension from the head of a multiple drilling machine of a plate to carry drill bushings, makes it necessary to devise some sort of suspension bracket of the compression type to hold the plate in proper position. Fig. 1 shows the arrangement on a multiple drilling machine for drilling and reaming ring gears. Two jig plates are used, one for the drills and one for the reamers, and there are three brackets to support each plate.

When the head of the machine has been brought down to begin the operation, each plate locates and rests over the dowels of the respective fixtures, while the drills and reamer continue through into the work. When the operation is completed, the head of the machine is raised and the springs of the suspension brackets hold the plates down upon the fixtures until the tools have been withdrawn from the work, when the plates are lifted off the dowels. The table is then indexed and a completed ring gear is brought before the operator, ready to be taken out of the fixture without the necessity for him to lift off a cumbersome jig plate.

Fig. 2 shows the construction of a very practical and convenient type of suspension bracket for this purpose.

Fig. 1—Suspension brackets on the machine

The casting *A* is patterned largely after the standard multiple-spindle drill bracket. The rod *B* supports the jig plate by a dowel through the hole *C*, and is encircled by a coil spring. The pin *D* is for holding the spring, but is often dispensed with and the spring allowed to rest directly upon the jig plate. The hole through

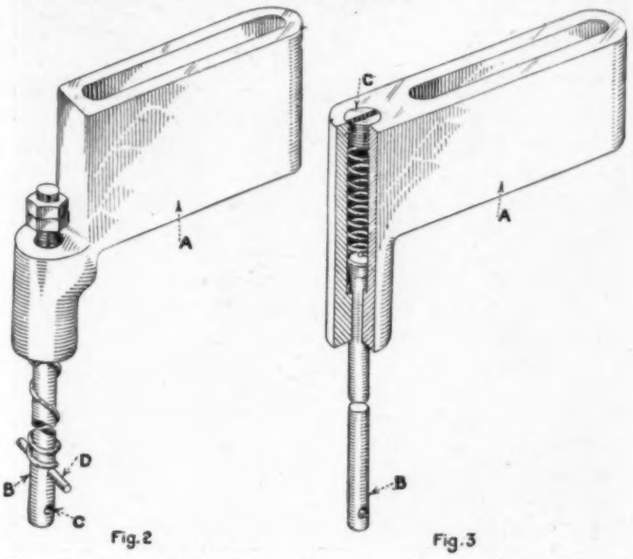


Fig. 2—A practical type of suspension bracket. Fig. 3 —Bracket with enclosed spring

the casting is of sufficient size to permit the rod to move easily. The locknuts at the upper end of the rod permit slight adjustments to level the jig plate.

Fig. 3 shows a type of suspension bracket with an enclosed spring, which is neater than the one shown in Fig. 2 but not so cheaply made. The rod *B* is turned with a head or has a collar pinned to its upper end. The hole through the casting *A* is of two diameters. At *C* a threaded plug retains the spring. No vertical adjustment of the jig plate is possible.

A Drill Properly Ground to Cut Tin

BY R. M. THOMAS

When drilling holes in sheet tin, it is always difficult to get a good clean hole unless the drill is ground especially for the purpose.

I sometimes have occasion to drill several thousand

A drill ground to cut tin

holes in this material, and I grind the drill as shown in the accompanying sketch. The center should be $\frac{1}{8}$ in. longer than the lip of the drill, and a center-punch mark should be made in the tin to start each hole.

A One-Man Riveting Fixture

By Hamilton Casey

A simple fixture that saves the time of one man is shown in the illustrations. The job for which it was designed is the riveting of the Franklin steering column sleeve to the base casting. Fig. 1 shows the old way

Fig. 1—Old method of riveting, and empty fixture

Fig. 2—New fixture in use

of doing the job on an anvil horn with a helper holding the work and dolly-bar. The empty fixture also appears in this figure.

The new way of doing the same work is shown in Fig. 2. The foot-operated clamp grips the sleeve, and a short dolly-bar with attached spacing bracket slips into the sleeve and is supported on the saddle of the fixture. The clamp is opened by a coil spring.

A Set of Tools for Bending Tubes

By Cyril B. Clark

Having occasion to bend a large quantity of tubes to the shape shown in Fig. 1, I designed and built the set of bending tools here illustrated, to be used in a standard bulldozer.

The body of the die, represented by the letter *A* in Figs. 1 and 2, is made of cast iron and is attached directly to the backplate of the machine. The remaining parts are all of tool steel, hardened, and, with one exception, are drawn only just enough to relieve the hardening strains. The exception is the feathered end of the part *B* where it comes into tangential contact with the segmental roller, or rocker, *C*; and this was drawn to a spring temper to forestall breakage of the thin and necessarily weak part.

Part *B* is attached permanently to the die-body and has no movement. Part *D* is a clamping shoe, held in a guide, or bracket, that is an integral part of the die body, and has no endwise movement. It is, however, capable of being moved to and from part *B*, through a slight range of adjustment and, with part *B*, forms a clamp to hold the tube to be bent. The outer face of *B* and the inner face of *D* are grooved to fit the tube, the semi-circular groove in each being left about $\frac{1}{32}$ in. shallower than the radius of the tube so that when part *D* is tightened by means of the hand-operated eccentric *E* and its connecting straps, the tube is clamped as in a vise.

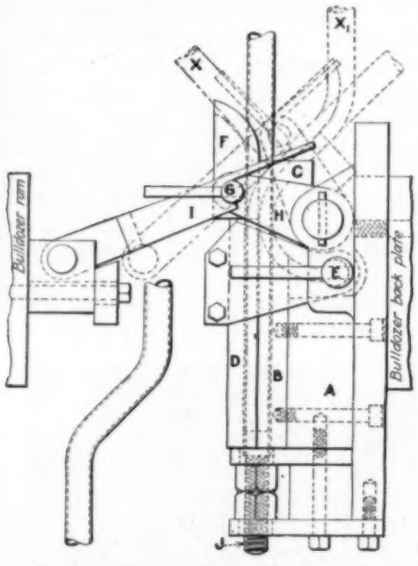


Fig. 1—The tools in the bulldozer

Part *F* is also a clamp, capable of being tightened upon the tube by the hand-operated eccentric *G*, and is, in effect, an extension of part *D*, though not attached to it. Its face has a groove that is a continuation of the groove in the face of part *D*, and, when tightened, clamps the tube against the correspondingly grooved face of the segmental roller *C*, which is so mounted upon a stud as to be capable of a partial rotation. The rotation of part *C* is accomplished through the levers *H* (one upon each end of the stud), actuated in turn by the yoked connection *I* from the ram of the bulldozer.

The face of part *F* and the semi-circular groove therein are rounded back at the upper end, as the sketch shows, to a radius equal to that of the bend in the tube,

but this is merely for clearance during the second operation, as will be described later, and has nothing whatever to do with the actual operation of bending. The eccentric *G* takes its bearings in the outer ends of the levers *H*, and is made long enough to provide a concentric shoulder on each end, outside the levers, to engage the forks of the yoked connection *I*, as the ram advances.

A most important member of the tools is the mandrel *J* from which the tube is drawn in the operation of bending, as upon the shape of its upper end and the

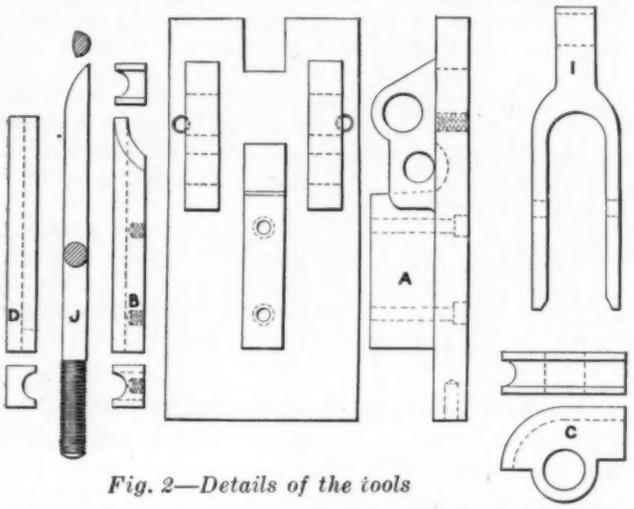


Fig. 2—Details of the tools

position of that end with relation to the active members of the bending device, depends the success or failure of the operation. It is attached to the body of the die at the lower end and has no movement in action, but is capable of minute adjustment endwise through the medium of the locknuts.

The action of the tools is as follows: With the parts in the positions shown by the full lines in Fig. 1, a piece of straight tubing is pushed down from the top into the hole formed by the mating grooves in the faces of parts *F* and *C*, and *B* and *D*, passing at the same time over the mandrel *J*, which is a close fit for the bore. The tube is clamped, though not very tightly, between *B* and *D* by turning the eccentric *E* by means of its pin handle. It is also clamped more tightly, between part *F* and the segmental roller *C*, by means of the eccentric *G* in the ends of the levers.

As the ram of the bulldozer advances, the forks of the yoked connector *I* engaged the concentric ends of the eccentric stud *G*, and turn the segmental roller *C*, the clamping shoe *F*, and the upper end of the tube to the positions indicated by the dotted lines. As the tube is thus wrapped around the roller *C* it is drawn off the mandrel, the rounded end of which prevents the tube from being distorted.

Having completed its forward movement, the ram now recedes, leaving the parts in the position shown until the release of the clamps and the withdrawal of the bent tube allow them to drop back by gravity to their original position. The dotted outlines *X* and X_1 show the tube when in place for the second bending, before and after the second bend is made, and discloses the reason why the upper end of part *F* is rounded to the radius of the curve in the tube.

The upper end of the mandrel is shaped to conform to the longer curve of the bore of the tube as far as possible without interfering with the wall of the tube when the latter, in its straight condition, is first placed in position for bending. The shape is a difficult one to calculate or describe, and is best worked out by trial. Its endwise position with relation to the active parts is very important.

The tubes to be bent must be free from burrs and should be wet with the soap solution used in connection with drawing dies. If the tube is seamed, the seam should be on the inside, or shorter radius, of the bend if a single bend is to be made, and upon the side if a reverse bend is contemplated. The point of greatest draw will be on the outside, or long radius bend, and it is desirable to keep the seam as far away from that point as possible.

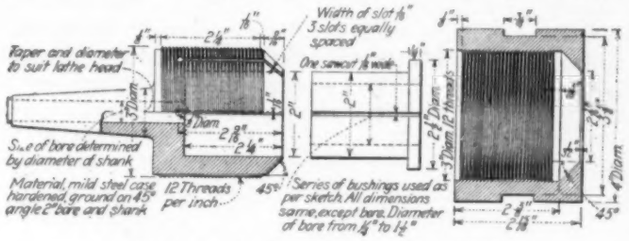
A Bar Chuck for the Engine Lathe

BY ARTHUR SILVESTER

A convenient and useful chuck to hold bar stock in the engine lathe is shown in the accompanying sketch. With this chuck many jobs that would ordinarily go to the capstan or turret machine can be handled to advantage in regular engine lathes.

The chuck may be made from a bar of mild steel of suitable size and should be turned to approximate dimensions both inside and out, leaving a sufficient allowance to finish by grinding. It should then be carbonized all over but not yet hardened.

After carbonizing, the thread should be cut on the outer diameter, three small holes drilled radially into the body 120 deg. apart, and saw cuts run lengthwise of the body to meet each of the holes. The hole through the shank should be made as large in diameter as is consistent with safety. This latter factor will depend


Taper and diameter to suit lathe head
Width of slot ⅛" 3 slots equally spaced
One saw cut ⅛" wide
Size of bore determined by diameter of shank
Material, mild steel case hardened, ground on 45° angle 2" bore and shank
12 Threads per inch
45°
Series of bushings used as per sketch. All dimensions same, except bore. Diameter of bore from ¼" to 1¼"
45°

Chuck for bar work in engine lathe

almost entirely upon the size of the through hole in the lathe spindle in which the chuck is intended to be used.

The piece may now be hardened, and ground upon the taper shank, after which it should be placed in the lathe in which it is to be used and the 2-in. bore ground to size. The 45-deg. angle at the nose should also be ground, care being exercised to make the angle correct and the surface smooth.

The shell may be made of similar material and need not be hardened, though it should be toughened by heating and quenching in oil. Particular attention should be given to the internal 45-deg. angle where it matches the corresponding angle of the chuck body. The outside of the shell should be flatted on opposite sides, as shown, to take a spanner.

A series of bushings to fit the bore of the body and having through holes of various diameters, increasing by $\frac{1}{32}$ in. up to the limit of size, may be made of bronze or gun metal. A single saw cut is made to split one side of each bushing. The final boring of each bushing should be done in place before the saw cut is made.

In the hands of careful workmen the life of such a chuck is unlimited, and it may be depended upon to run true.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Too Much Investigation Is Dangerous

THE real danger of the prolonged investigations at Washington may lie in the development of mob psychology and its possible denunciation of the Government as a whole. Where there is guilt, mete out punishment. Nor wait so long that the nature of the guilt is not clear cut.

In wide-spread investigation, careless of whom hurt, issues are clouded and reputations smirched. When an individual is accused of wrong-doing, directly or by implication, and he is not permitted at once to defend himself, he is convicted in the minds of many people, especially in those minds most easily influenced against law and order.

It is in human nature for all to be tempted and for some to fall. Since there are dishonest people in the population at large, it seems certain that there will be some dishonest people in government positions. It is none the less true that people are inherently honest and the exposition of the small proportion who are dishonest should not brand the government as a whole. There is that tendency, which ought to be avoided, but which is not being avoided in permitting wholesale suggestive evidence.

Other countries have weathered scandals worse than ours. We will weather the eighteen investigations now going on. By quickly finding the guilty and more quickly punishing them, the danger of denunciation of government through mob psychology is best combatted. If results are to be achieved quickly, it will be necessary to stop the wholesale defamation of character now so popular in Washington.

Are You Charging Enough for Repairs?

IT IS poor economics to give away repair parts, and a regrettable policy to make somebody who does not use them pay the bill. No manufacturer would think of giving away the machines that he makes.

Justification can be found sometimes for selling parts below cost where the sale is part of a promised service, or where it will build valuable good will. Then the loss must be made up on new sales. The concern following such a policy must feel reasonably sure of getting its share of the new business.

The best of machines will wear out if used to the limit of production. Repairs are necessary from time to time and their function is to prolong the life of the machine. They mean additional return from the original investment. Why shouldn't they be paid for in proportion to the service they render?

The latest sales argument for life insurance is based on the idea of insuring up to the point where income for dependents will remain practically constant when the family provider dies. This argument does not make the insurance any more valuable, but it does sell it. A growing tendency today in selling machinery is to sell (and sometimes to base the price) on what it will do—the production it will give, the service render.

Now repair parts. Apply the same principle and see where it leads. It permits a price that is somewhere below the cost of the parts were the man himself to make them. Relatively the prices will be somewhat lower than the prices of repairs for commodities sold to consumers not equipped to make their own parts.

In setting any prices costs have to be known and in the determination of costs of repair parts, care must be exercised not to make the cost of finding the costs too high. The whole matter boils down to a few necessary steps: Use the simplest system of caring for orders that you can devise; determine costs (without elaborate detail); charge for results made possible by the parts, as well as material and labor; get repair parts shipped promptly; and be ready with sound argument to meet sales resistance.

The repair part business can be put on a high plane, with profitable prices fully justified, and can be made a paying part of the business instead of a tolerated nuisance. The very first thing to do is to ask yourself, "Am I charging enough for repair parts?"

Machine Tools in Electric Railway Shops

IN WHAT shape are the machine tools in the electric railway shops? This is a fair question and one that has been asked about almost every kind of shop in the country. Answers have been given where some other shops are concerned, but not heretofore for the electric railway field.

On another page we have the privilege of republishing the results of an exhaustive survey recently made by *Electric Railway Journal* and appearing in its annual maintenance number. Publication of the results of the survey represents the firing of the first gun in the fight being waged by *Electric Railway Journal* for appropriations for machine tools in the electric railway shops in the interest of efficient and economical maintenance.

It is significant that only twenty-eight per cent of the machine tools in electric railway shops are less than ten years old. One could hardly be accused of exaggeration in stating that of those more than twenty years old the great majority are either obsolete or worn out, or both.

The survey probably gives an accurate picture of actual conditions. Reports were received from sixty-two properties, in all parts of the country. The shops are divided into three classes on a basis of number of cars operated and the figures are so classified.

Just Suppose

JUST SUPPOSE, Mr. General Manager, your accountant came to you and asked you how he should post certain things, would you set him straight? Of course you would, and anyhow, you could. But suppose a man came to you and asked you how much feed he should use for a certain milling cut would you set him straight, too? You say that is his foreman's business? Well, but if that foreman asked? Would you? Could you?

Well, you, say, you would like to see the foreman who is fool enough to come to you with a thing like that.

That's all right, but—Just suppose.

Shop Equipment News

Dreses 6-Ft. Ball-Bearing Radial Drilling Machine

The Dreses Machine Tool Co., Cincinnati, Ohio, has recently added to its line of drilling machines a 6-ft., multi-duty, ball-bearing, radial drilling machine. The notable features of this machine include the wide use of ball bearings, convenience of all operating controls, automatic lubrication for the head gearing, and an exceptionally simple and convenient control for the arm elevating mechanism.

The head is entirely inclosed and slides on three bearings on the arm, two in front and one in back, a method of mounting intended to distribute the torsional strain of drilling over the entire arm. The clamping lever is located at the lower left-hand corner, and can be seen in Fig. 1 with its handle near the spindle. This lever operates two widely separated clamp screws that draw the head firmly against the lower guide rail.

The hand traverse of the head is obtained by means of the handwheel at the lower right-hand corner of the head, the traverse mechanism being mounted on ball bearings to insure easy operation. The spindle runs in renewable phosphor bronze bearings and the thrust is carried by two ball bearings. The feed rack is cut directly on the spindle sleeve, and both sleeve and pinion are of heat-treated alloy steel.

The tapping, starting and stopping mechanism is of the friction type and is controlled by the horizontal lever shown below the head in Figs. 1 and 2. The frictions are of large diameter, designed for convenient adjustment and for easy engagement and disengagement under heavy feeds. The bevel gears are heat-treated and hardened and the entire mechanism runs in oil.

The two levers mounted at the lower left-hand corner of the head are used to obtain the four changes of speed which are available in the head. These changes, combined with the eight changes in the speed box, provide a total of 32 spindle speeds. The spindle driving gear, with two long tool-steel keys for driving, is carried on an annular ball bearing.

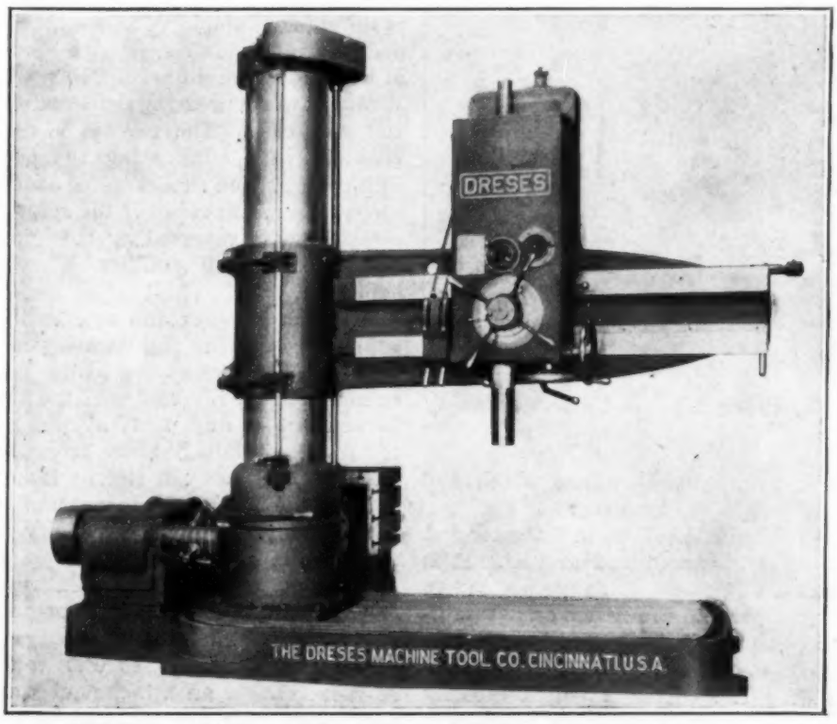


Fig. 1—Dreses 6-Ft. Ball-Bearing Radial Drilling Machine

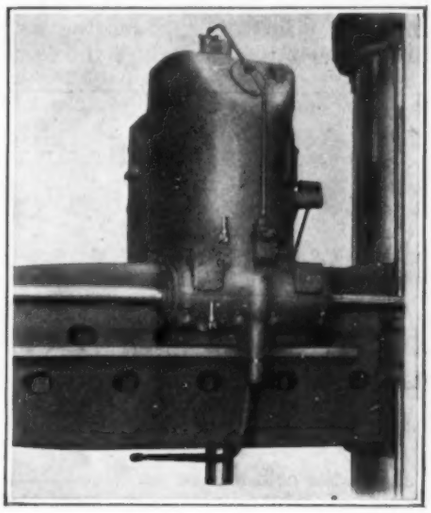


Fig 2—Rear view of head

Fifteen feeds for the spindle are available, five of them being tap leads for 8, 11½, 14, 18 and 27 threads per inch. These feeds are quickly obtained by means of levers on the front of the head. The feed mechanism includes a safety friction device in the drive, in addition to the friction-driven quick return.

The friction clutch for the quick return can be adjusted from outside the head with a screwdriver. Any-one of four levers can be used to operate the clutch, the dial being graduated in even divisions. An automatic adjustable trip for the feed is provided and can be set to operate at any point in the stroke of the spindle. A positive safety trip is also provided at each end of the spindle travel.

The annular ball bearings in the head are standard sizes and mounted according to the standard practice. The lubrication of the head is a combination of splash and force feed. The back gears and spindle drive

gears are oiled by a power driven pump located at the rear of the head as shown in Fig. 2. This pump takes the oil from a reservoir and delivers it through suitable piping to a sight-glass at the top of the head, from which it flows over the gears and bearings back to the reservoir.

The column is composed of two parts, the inner member being bolted to the base and reaching to the top of the outer sleeve. The top cap entirely closes the top of the column and carries the steel drive gears and shafts in ball bearings. The mechanism is oiled by sight-feed oilers. The miter gears in back of the arm

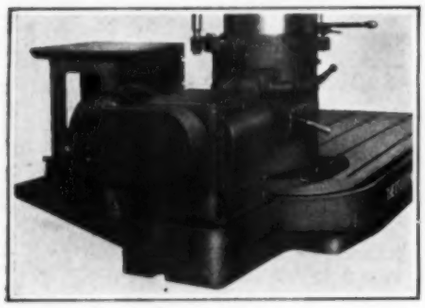


Fig. 3—Constant-speed motor drive

and in the column are machined from forgings and are heat treated and hardened.

The completely inclosed speed box, Fig. 3, is of the cone-and-tumbler type, operated by means of a single lever. It is clearly indexed and the successive speeds are arranged in adjacent positions for convenience in increasing or decreasing the speed. The entire mechanism runs in an oil bath, ball bearings are used throughout, and all shafts and gears are heat treated. A self-releasing overtake clutch causes the machine to always run at its slowest speed when changing speeds in order to overcome shock.

The lower rib of the parabolic box-section arm is double webbed to resist bending and torsional strain. The arm is lowered at twice its elevating speed and has an automatic trip at both extremes. One lever controls the clamping, elevating and lowering of the arm, and is placed in such a position that the operator need not leave his operating position. This control eliminates the danger of an accidental engagement of the elevating mechanism when the arm is clamped. In addition the gearing is automatically disengaged if the arm strikes any obstruction.

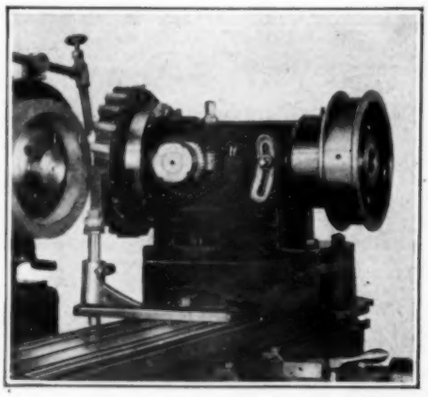
The convenience of the operating controls is notable, since all operating levers on the head are located within a 17-in. radius. At the same time ample hand and operating clearance for all levers is provided. The levers on the speed box, and the column and arm clamping levers, are all located in a similar small space.

The machine may be driven by a belt through a speed box, by a constant-speed motor and speed box, or by a variable-speed motor drive. The constant-speed motor drive arrangement is illustrated in Fig. 3. A plain box table is regularly furnished with the machine and a universal table can be furnished, if desired.

Thompson Milling Cutter Grinding Attachment

An attachment for grinding large milling cutters is now being marketed by the Thompson Grinder Co., Springfield, Ohio. The device is shown in the accompanying illustration, mounted on the table of the Thompson 10x36-in. grinding machine which was described on page 84, Vol. 45, of the *American Machinist*.

This headstock has a 32-in. swing. The spindle is mounted in roller bearings and has a perpendicular swivel through an arc of 30 degrees. The spindle frame mounting also permits a horizontal swing of 90 degrees, the two adjustments making it possible to obtain any position of the work in



Thompson Milling Cutter Grinding Attachment

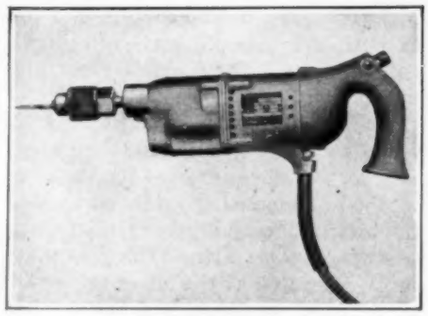
relation to the grinding wheel, and any angle of clearance.

The spindle is 5 in. in diameter and is pack-hardened and ground. It is fitted with a 10-in. flange, slotted to correspond to the flange on any milling machine spindle, and is regularly furnished with a No. 16 B & S taper hole. The cutter is bolted directly to the flange in the same position it would occupy on the milling spindle.

The attachment can be mounted on either end of the grinding machine table so that it will accommodate either right- or left-hand cutters. The swivel adjustments permit the grinding of both face and periphery of a cutter without removing it from the attachment, a cup wheel being used to obtain straight clearance.

Thor Reversible Electric Tapping Machine

A portable reversible electric tapping machine, known as the Thor size UKR, has recently been placed on the market by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. The machine is intended for use in tapping holes up to ⅜ in. in diameter and for re-tapping larger sizes up to ⅝ in. The type of motor used in the machine is the same as employed in the standard Thor electric drill, but the speed of the spindle is reduced to 550 r.p.m. through worm gearing enclosed in the gear case. The reverse is mechanical, thus eliminating the possibility of sudden shocks to the armature which might result if the spindle rotation were reversed by changing the direction of rotation of the armature.



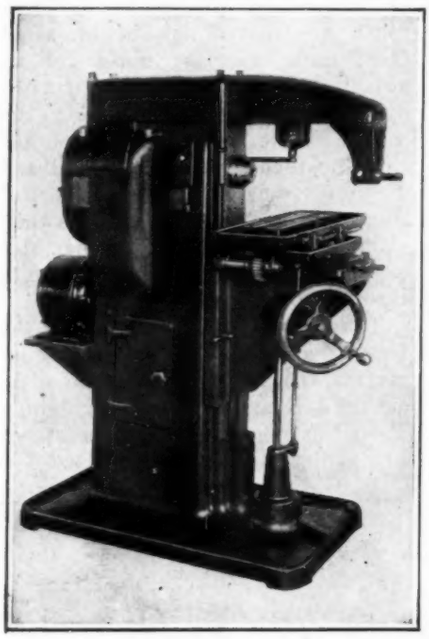
Thor Reversible Electric Tapping Machine

A clutch engages and rotates the spindle toward the right when pressure is exerted on the tool. The spindle can be reversed and the tap backed out at any point by pulling the machine slightly away from the work. The gears can also be locked so that the machine will operate in reverse only. It is not necessary to shut off the current between tapping operations, since the spindle runs free. The motor is universal, operating on either alternating or direct current at from 110 to 120 volts. A ⅜-in. chuck, an attachment cord and socket plug are included in the equipment. Weight, 6¾ pounds.

Pratt & Whitney 5-In. Production Hand Milling Machine

A 5-in. hand milling machine, designed expressly for production work, although suited to general hand milling operations, is now being marketed by the Pratt & Whitney Co., 111 Broadway, New York, N. Y.

In the design of this machine an endeavor has apparently been made to provide as simple a construction as possible. All gearing and moving parts are housed in the vertical column. Transposing slip gears are



Pratt & Whitney 5-In. Production Hand Milling Machine

used for changing the spindle speeds, a cover on the rear of the column giving ready accessibility.

The spindle is mounted in bronze bushings that are adjustable for wear, the front bearing being conical. A ⅝-in. hole for a draw-back rod is provided through the spindle, the spindle nose having a No. 9 B & S taper hole to fit standard arbors. Maag gears are used for the spindle speed change gears, and a range of speeds, in geometrical progression from 65 to 650 r.p.m., is provided.

The overhanging arm is a ribbed casting instead of the usual solid bar. This arm provides a stronger and more rigid support without any increase in weight. The outboard support fits into a T-slot on the under side of the arm and carries the usual mounting for an arbor. The arm is attached to the column by four bolts, so located that the arm may be reversed and fastened out of the way when it interferes with high work. A cover for the top of the column is furnished when the arm is not desired.

The working surface of the table is 5x17 in. and a ⅝-in. T-slot is provided for mounting fixtures. The total longitudinal travel of the table is 12 in. and the knee has an 8-in. vertical adjustment, giving a maximum distance between the table top and the spindle center of 9 inches.

The table feeding devices are similar to those employed on former Pratt & Whitney hand milling machines. The longitudinal travel is obtained through a lever, pinion and rack, the vertical adjustment being made by a handwheel that operates the elevating screw through miter gears. The cross slide is operated by a crank fitted with a micrometer dial for fine adjustment. The various controls are conveniently located so that the operator can reach all of them without shifting his position. Stop dogs are provided in both directions and suitable binders are provided on all slides.

The machine is particularly designed for motor drive, the motor being geared directly to the spindle and controlled by means of a push-button or snap switch mounted on the machine. The motor is located on a bracket about half way up on the rear of the column, its position being low enough to avoid vibration and high enough to keep the motor clear of chips and sweepings from the floor. The bracket mounting makes the motor accessible for lubrication, inspection and adjustment.

A single-pulley belt drive can be furnished if desired, the pulley being mounted within the column. Belt guards are then placed on either side at the top of the column and a loose-pulley countershaft is used. A small oil pot is regularly furnished but a pump lubricating system can be installed. The pump is located inside the column above the oil reservoir and driven by a chain from the main drive shaft.

New Jersey Portable Service Elevator

An elevator, designed to handle loaded trucks, wheel-barrows, etc., from one elevation to another in places where the usual freight elevator would not be practicable, is now being marketed by the New Jersey Foundry & Machine Co., 90 West St., New York, N. Y. The apparatus may be used in a fixed position or moved about from place to place as required.

New Jersey Portable Service Elevator

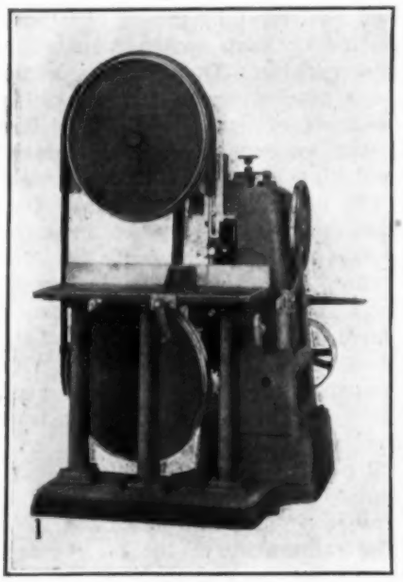
This elevator is especially suitable for serving cupola charging platforms, gas generators, and grinding and mixing machine hoppers. It is also useful for serving mezzanine floors, for elevator service between two floors, or from floor to box cars. The standard capacities range from 1,000 to 6,000 lb., and the platform sizes from 42x60 in. to 6x10 feet.

The device is a complete unit that requires no support from the building, and the method of suspension of the platform causes it to remain level under capacity loads. Automatic electric stops are provided at the extremes of the platform travel, and the movement of the platform can be controlled from either the high or low level or the platform.

The motor is automatically stopped by the occurrence of such troubles as low voltage or failure of current, and the brake is applied. The device is simple in operation and can be used by unskilled labor.

Stockbridge Metal Cutting Bandsaw

The Stockbridge Machine Co., Worcester, Mass., has recently placed on the market a high-speed bandsawing machine, designed for high-speed metal cutting and to function properly on all kinds of metals under varying conditions. The features of the machine are its substantial and rigid parts, ample wearing surfaces for all moving parts, and the fine adjustment for pressure of the saw teeth against the work.



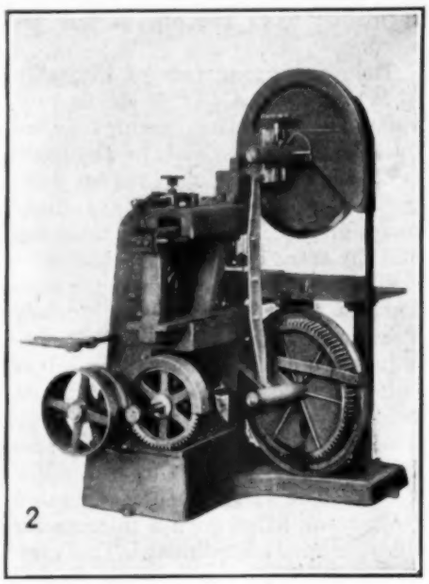


Fig. 1—Stockbridge Metal Cutting Bandsaw
Fig. 2—Rear View of Machine

The machine consists of a base on which are fastened a column and the work support table. The bandsaw wheels are mounted on a ram, that slides on scraped ways on the column, and move with the ram. The saw operates in a vertical position, as shown in Fig. 1, and is positioned by two sets of guide rolls located directly above and below the work. The rolls are square with the ram and the top rolls are adjustable up and down for different sizes of stock.

The forward movement of the ram toward the work is caused by counterweights that constantly tend to thrust the ram forward. Without any supplementary mechanism these weights would give a constant pressure of the saw against the work, regardless of the kind of material, and suitable apparatus is therefore provided to allow the pressure being varied to suit conditions.

A wheel, shown mounted on the side of the column in Fig. 1, is rotated through a rack and pinion by the ram as it moves toward the work. A friction pad is attached to a counterweighted lever and bears against the periphery of the wheel, the amount of friction depending on the position of the counterweight. A balanced saw pressure control is obtained through this simple mechanism, the feed being automatically controlled when the friction counterweight has been positioned on the lever. An automatic stop can be set to stop the feed at any point of the ram stroke.

The fixed guide rolls are mounted on Hyatt roller bearings and the tension guide rolls have ball bearings. All bearings in the machine are provided with dust-proof caps, and self-oiling bearings support the band wheels. A tension screw, carried in a pivoted slide, keeps the band taut and in alignment, when in use.

The machine may be driven from a lineshaft to tight and loose pulleys on the drive shaft, or a direct-connected motor drive can be furnished. Three sizes of the machine are available, cutting either squares or rounds up to 6, 9, and 12 in., respectively.

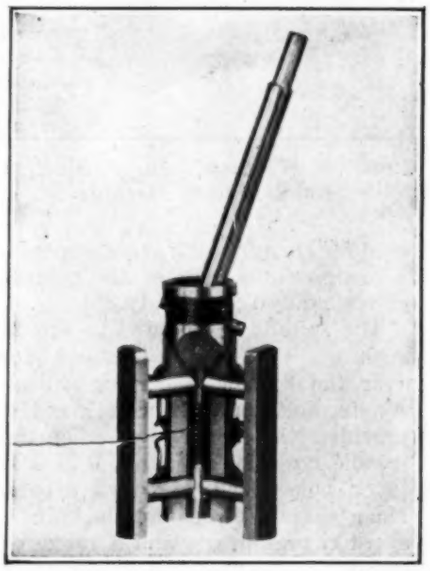
Though primarily designed to cut from the bar, a variety of work can be handled, and it will also perform many machining operations with a saving in cost. The blades used are $\frac{3}{32}$ in. thick, so that a comparatively small amount of stock is wasted in cutting-off operations.

Hutto Portable Cylinder Bore Grinder

The Grinder Sales Co., 526 West Fort St., Detroit, Mich., is now marketing the Hutto portable grinder for automobile cylinder bores. The tool is adapted for regrinding operations and it is possible to perform the work on open-end cylinders without removing the motor from the chassis.

The device carries three grinding stones in suitable holders, the outside diameter over the stones being adjusted by a set of opposed cones or wedges at the center. These cones are moved toward or away from each other by means of an adjusting screw that can be turned by a screwdriver inserted in the socket at the top. The socket has slots in which the pins on the ball end of the driving handle are inserted. The other end of the handle is then clamped in the chuck of any portable electric drill to rotate the grinder in the bore of the cylinder.

The operation of grinding the bore of a cylinder is started by inserting the device in the bore without the driving handle and tightening the adjusting screw until the stones are against the cylinder walls. The driving handle is then inserted and the grinder is passed up and down in the bore as it rotates, the stones being lubricated by kerosene. When the tool runs free, the adjusting screw is again tightened and the operation is repeated until the required diameter of bore is obtained.



Hutto portable cylinder bore grinder

It is claimed that the device will

grind the bore of a cylinder to an accuracy limit for roundness and taper of 0.0005 in. Various sizes of stones are available for different diameters of bore and can be quickly inserted in the device.

"Venturafin" Unit Heater

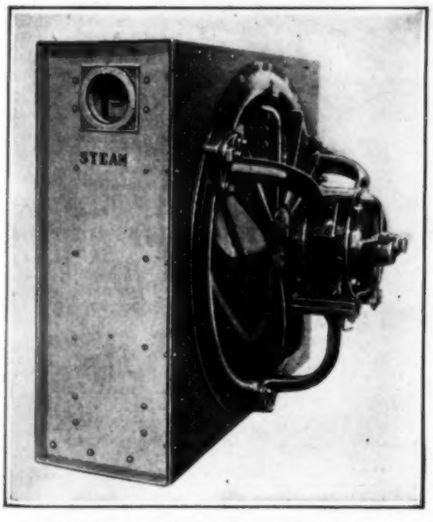
For heating service in industrial buildings, warehouses, etc., the American Blower Co., Detroit, Mich., has recently placed on the market the "Venturafin" unit heater. The device is exceptionally compact and, on account of its light weight, is adaptable to a variety of installation requirements.

The notable feature of the apparatus is the construction of the steam coils. The pipes of these coils are straight copper and brass tubes about which copper ribbons are wound forming continuous helical fins. These fins increase the heat-radiating area of the tubes and make possible the compactness of the heating element.

The tubes are arranged in rows, three deep and staggered, the ends of the tubes being fastened in copper headers that allow sufficient flexibility for contraction and expansion. The steam pipes and headers are built to withstand a steam pressure of 50 lb. per square inch. The air is forced through the heater by a standard, motor-driven, "Ventura" fan, the motor being furnished for direct or alternating current, as desired.

The usual method of installation is to mount the heater at the top of a steel housing, so designed that cold air is taken from near the floor and discharged through the heater at the top. Other methods may be used to suit conditions.

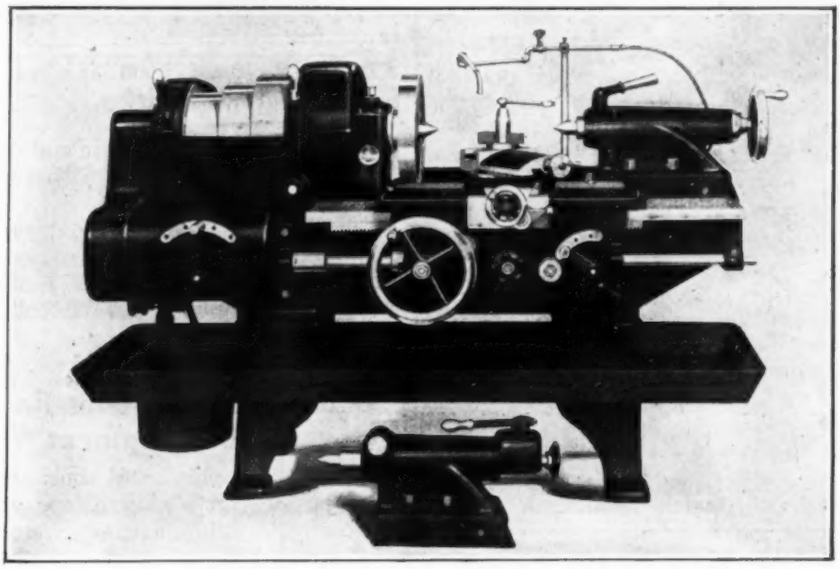
The capacity of the heater is approximately 3,000 cu.ft. of air per minute, heated from 60 to 115 deg. F. with steam at 5 lb. per square inch pressure. The heater is 29 in. high, 32 in. wide and the over-all depth is 24 in. in a direction parallel to the motor shaft.



"Venturafin" Unit Heater

Monarch Friction Head Manufacturing Lathes

A recent addition to the line of lathes manufactured by the Monarch Machine Tool Co., Sidney, Ohio, consists of a series of friction head manufacturing lathes, built in a range of four sizes, 14-, 16-, 18-, and 20-in. The 18-in. lathe is shown in the accompanying illustration.



Monarch 18-in. Friction Head Manufacturing Lathe

The friction headstock is simple in design and so constructed that liability of wear or getting out of adjustment is comparatively slight. Heavy ball thrust bearings are provided to take the thrust of the spindle. The friction clutches are of sufficient size and strength to operate properly under the heaviest cuts in the capacity of the lathe. A lever conveniently located on the front of the headstock controls the starting and stopping of the lathe. A brake is provided to stop the spindle quickly.

The plain headstock is so designed that back gears can be installed if desired. The back gear mechanism is supported by the gear guard housing, this housing being interchangeable with the regular gear guards provided on the open-belt type of headstock.

These lathes are particularly adaptable for special requirements since they can be built in practically any style and with special attachments to suit the work. Such attachments include automatic length stops, special tool rests, forming attachments, quick-acting tailstock, etc. Other special devices can be built to meet the requirements of high-speed production of various duplicate parts.

The spindles are made from high-carbon steel forgings and are mounted in phosphor bronze bearings. The carriages have long bearing lengths on the beds and felt wipers are provided to keep the ways clean. The aprons are of the double-plate type, and an oil reservoir is provided in the apron back plate from which the rear apron bearings are automatically oiled.

A quick-change gear box that provides 32 changes of feed or thread, or a semi-quick change gear box, can be furnished. The latter gives three changes of geared feeds by means of one lever on the front of the gear box and, by means of a quadrant, additional gears may be used for threads. All gears are steel.

The usual regular equipment is furnished, including a faceplate, dog plate, center rest, compound rest, centers, chasing dial and stop.

Young Tool Grinder

The Young tool grinder, the features of which are shown in the accompanying illustrations, is now being marketed by Keuka Industries, Inc., Hammondsport, N. Y. This grinder is constructed with the idea of relieving the machine of the usual early tendency to chatter found in this type of equipment and caused by dirt and grit entering the bearings.

The sectional view of the type of bearing installed in this machine, Fig. 2, illustrates the method employed to keep out the dirt and grit.

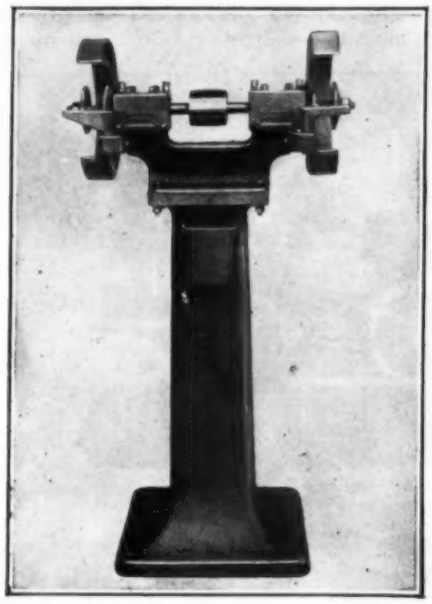


Fig. 1—Young Tool Grinder

The spindle overhangs into an oil well at either end of the bearing and, as it rotates, picks up a bead of oil that seals the bearing surfaces against the entrance of foreign matter. The fine abrasive particles from the grinding operation are caught by this oil bead and are deposited as sediment in the bottom of the well.

Since the bearings are sealed against the entrance of abrasive material, it is possible to run an oil groove across the bottom of the bearing, connecting with the oil wells, from which it is constantly kept filled. This assures positive lubrication and also tends to prolong the life of the bearing.

The thrust of the spindle is carried by V-shaped collars which fit suitable grooves in the bearing. This construction is said to automatically compensate for wear within reasonable limits, causing the wheel to run smoothly and without chatter for a long time, even under conditions of unusual thrust.

Other notable features of this grinder include a large spindle that tends to eliminate whip and provides a large bearing area, a considerable distance between the wheels so that both can be used at once without interference, and solid tool rests that

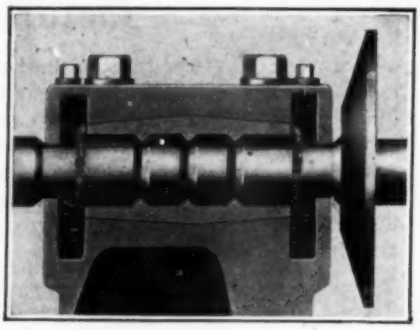


Fig. 2—Sectional view of Young grinder bearing

will not move or turn in use and can be pushed back out of the way when not required.

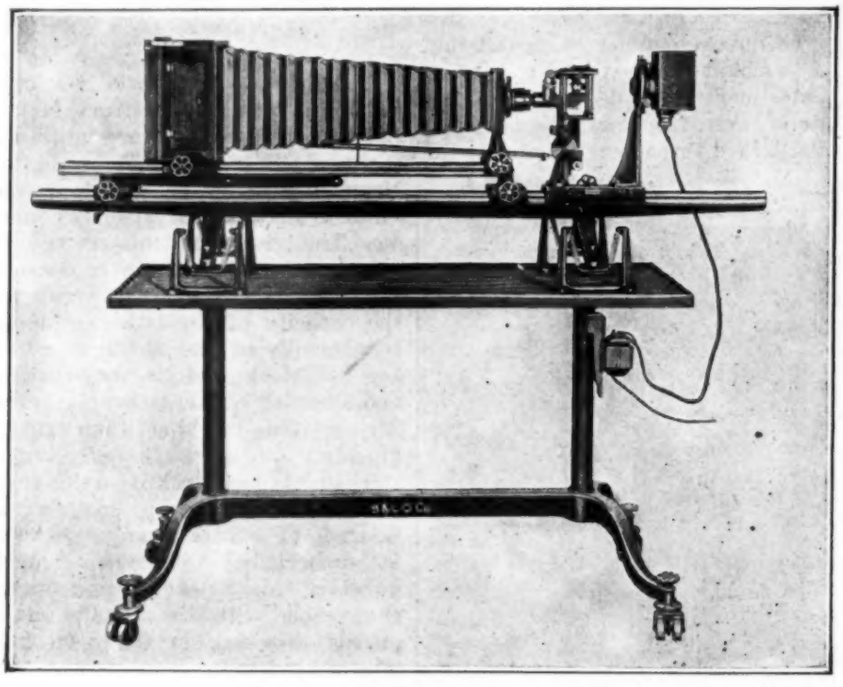
The machine can be belted to a countershaft, or a self-oiling loose pulley can be mounted on the spindle, so that the grinder can be belted directly to the lineshaft.

Bausch & Lomb Metallographic Equipment

A metallographic outfit consisting of a large inverted microscope and a complete illuminating system, mounted upon a common base, has recently been placed on the market by the Bausch & Lomb Optical Co., Rochester, N. Y. The complete GL-ILSR-9 outfit is shown in the accompanying illustration, the camera bed being mounted upon spring shock-absorbers on the supporting stand.

The metalloscope proper is mounted in front of the camera, the microscope and illuminating unit being carried on the same base. The microscope apparatus is supported on a vertical column of large cross-section and a graduated scale is provided on the rack slide that moves the stage upward or downward with reference to the fixed objective. By means of this scale and rack the stage can be quickly set for different objectives so that the object will be approximately in focus, and the final focusing can be easily accomplished with the fine adjustment only.

The stage of the microscope is provided with a rack and pinion movement in two directions and has a circular stage plate with a V-slot in it to accommodate specimens of various sizes and shapes. The fitting and aligning of the microscope and the illuminating unit on a common base permits the removal of these parts from the optical bench if the camera is to be used for other purposes, or if it is more convenient to have the metalloscope on a table when used only for visual operation. This mounting of the metalloscope



Bausch & Lomb GL-ILSR-9 Metallographic Outfit

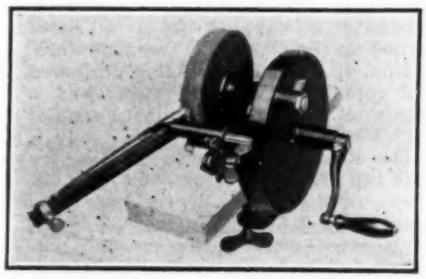
also provides permanent alignment of the condensing lens system on the illuminating unit with the center of the vertical illuminator.

The vertical illuminator is provided with a side tube and condenser, a sliding diaphragm with four apertures, and a ray filter giving practically monochromatic light. A recently developed light source is available in the form of a Mazda lamp with a solid strip of tungsten, providing a homogeneous and constant light source and making possible the standardization of an exposure factor. A tungsarc lamp or a hand-feed arc lamp may also be used, as such lamps can be furnished in housings which are readily interchangeable on the illuminating support.

The apparatus is sufficiently flexible to permit, with the use of special attachments, the making of photomocrographs of fairly large area at low magnification, the use of either oblique or vertical illumination, and the setting of the camera in a vertical position.

Luther No. 177 Railway Grinder

The accompanying illustration shows the Luther No. 177 railway grinder, which has recently been placed on the market by the Luther Grinder Manufacturing Co., Milwaukee, Wis. The machine was designed for use in grinding either flat or twist drills, chisels, dies, or similar tools, using the attachments supplied with the machine.

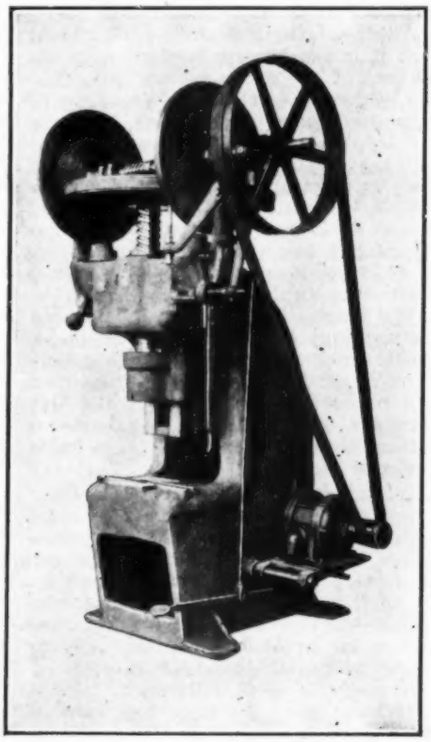


Luther No. 177 Railway Grinder

The attachment shown in use is designed to make it possible for an unskilled workman to grind the correct angle on a drill. The attachment has but two adjustments, one for the length and the other for the diameter of the drill, and is arranged to swivel on the holder to enable the entire surface of the drill to be ground smooth and uniform. The attachment for grinding flat drills can be applied to hold the drill in each of three different positions, enabling the operator to grind the proper clearance on the drill and to grind a rake on the cutting edge. A wheel dresser is supplied, and can be applied to the attachment bar, making it possible to dress the wheel uniformly. A Luther "Dimo-Grit" wheel is standard equipment with the machine.

Zeh & Hahnemann No. 2-8½ Percussion Power Press

A recent addition to the line of percussion power presses manufactured by the Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J., consists of the No. 2-8½ size, the main features of which are shown in the accompanying illustration.



Zeh & Hahnemann No. 2-8½ Percussion Power Press

This press has an open throat or gap so that long work may be inserted under the ram, projecting either at the sides or from front to back. The frame of the press is made from a steel casting, so that it will be sufficiently strong to withstand the strains produced by the press mechanism.

The driving mechanism for the ram is similar to that of the No. 20 press, described on page 605, Vol. 59, of the *American Machinist*, and consists of two friction disks driving a flywheel attached to the top of the ram screw. One disk drives the ram downward, the engagement of the other with the flywheel giving the upward movement.

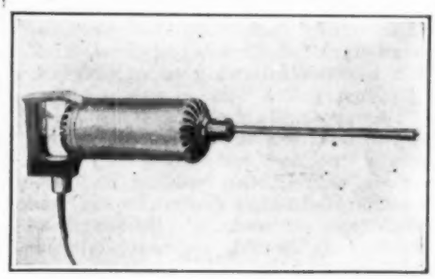
The friction drive accelerates the flywheel gradually and all the energy of the rapidly moving wheel is utilized as the ram meets the work and brings the wheel to a dead stop. A brake is provided on top of the flywheel to insure prompt stoppage at the extremity of the upstroke and to hold the flywheel in neutral position. An emergency stop is also provided underneath the flywheel to prevent damage if the empty press is tripped, as the flywheel would otherwise strike the frame and injure the screw.

All shafts are mounted in ball bearings and the mechanical efficiency is said to be high. The press illustrated is equipped with a constant-speed motor belted to the friction drive shaft.

"Syntron" Type F Electric Hammer

A smaller and lighter model of the "Syntron" hammer, designated type F, has recently been placed on the market by the National Electric Manufacturing Co., Pittsburgh, Pa. The former model was described on page 309, Vol. 59, of the *American Machinist*.

This hammer works on the same principle as the former model and is designed for the lighter forms of work, such as drilling holes up to ½ in. in diameter in concrete, and light chipping. A movable piston in the device reciprocates in synchronism with the alternations of the electric current, the hammer striking 3,600 blows per minute when attached to a 60-cycle a.c. circuit.



"Syntron" Type F Electric Hammer

For direct current a small rotary converter is supplied. It is claimed that the tool consumes no more power than the ordinary domestic flat iron, or less than a kilowatt.

News of the Week

Curtailed Auto Schedules Keep Output Still Equal to Last March

Cheaper cars produced at same record-breaking fare

There has been a definite slowing up in the motor car industry in March. Sales are not up to the pace set in January and February, when the totals were considerably above the same months of last year, and there is some indication that the total for March will not be above the same month of last year.

In consequence of this a number of manufacturers have reduced their schedules. This decision on the part of numerous manufacturers to curtail production from the plane reached in the earlier months this year is due to pressure from the dealers. With sales slowing up, dealers found themselves with more cars on hand than they could comfortably handle and appealed to the manufacturers for a respite.

There is a disposition in some quarters to blame the tire manufacturers in part for the let-up in buying. It is pointed out that the rubber companies are carrying on an extensive campaign in favor of balloon tires. At the same time manufacturers have been engaged in turning out cars which are not equipped with balloon tires. It is contended that the desire for balloon tires has been aroused in many prospective motor car buyers and they hesitate to purchase cars not so equipped. It is likely that this matter of balloon tires will be the object of a controversy more violent by far than was the introduction of four-wheel brakes last year.

A canvass of the industry disclosed that it is the largest producers, or the makers of the lower priced cars, that are holding most closely to schedules of high production. That these, however, are keeping a close watch on the situation is indicated by the fact that one of the largest, who had placed orders for material for future delivery, has placed a stop on these orders. That does not necessarily mean that the large producer is going to curtail, but it shows a disposition to play safe.

The disposition of all leading manufacturers at this time is to adopt an elastic production schedule rather than a fixed production mark. Production will probably be governed by the way cars are moving from the salesrooms rather than on an arbitrary quota system.

Bank Warns Against Over-Production

The official publication of the National Bank of Commerce, New York City, has the following to say regarding industry:

"The present high rate of iron and steel production is the result of especially active demand from three sources, namely, the building and construction industry, the railroads and the automobile makers. Building and construction should be maintained at satisfactory levels for some time to come, even though the building shortage is gradually being made up. If the railroads can be assured of fair returns, their purchases will provide a steady demand of large proportions, especially for iron and steel and for the many raw materials and manufactured products required for their maintenance and improvement. At the same time, there is no doubt that their heavy buying during 1923 and thus far in 1924 is in part to overcome the effects of the starvation period of prior years.

"The third factor which has stimulated activity, not only in iron and steel but in many other industries, is sustained demand from automobile manufacturers. The ultimate consuming power of the country is unknown, but production cannot expand indefinitely. In fact, as purchases by those who become car owners for the first time decline in importance, capacity may be found to be in excess of current requirements.

"When these three lines lose some of their present momentum the course of business will depend increasingly on other industries many of which are overbuilt in relation to present and potential demand."

Germans Will Attend Motor Congress

The interest which German automobile dealers are taking in the American automotive industry is further evidenced by the announcement that the German Automobile Dealers' Association, which has a membership of 2,000, will be represented at the World Motor Transport Congress in Detroit, May 21-24, 1924, by its general director and seven members, according to *Commerce Reports*. The delegation will spend three weeks investigating production plants, assembling methods, repair service, distribution and sales practices, advertising, disposal of used cars, storage practice, installment payments, automobile insurance, licenses, taxes, and traffic regulations. As additional evidence of the imminent improvement in the German market, a large number of trade opportunities from that country will be found elsewhere in this issue. Most exporters are watching this country's condition carefully.

Annual Reports Show Improved Business

The General Motors Corp. has issued its official report for 1923 showing only small changes from the preliminary report of Feb. 6. Net operating profits, it is stated, were $91,698,666 in 1923 against $80,366,402 in 1922, and a balance after depreciation charges of $76,642,963, against $66,781,613. After setting aside reserves for Federal taxes and other deductions and including dividends on the debenture and preferred stocks, net income was $55,180,154 available for the common stock, comparing with $45,066,907. The net income for 1923 was equal to $2.67 a share earned on the 20,646,327 shares of common stock of $10 a share par value outstanding comparing with $2.19 a share earned on the common stock in 1922.

The Standard Screw Co. reports $434,504 net income for 1923, after all charges, against $236,465 in 1922. After dividends on the preferred stock, the balance equaled $6.46 a share earned on the $5,950,000 common stock, against $3.14 in 1922. After preferred and common dividends, there was a deficit of $329,044, against one of $513,083 in 1922.

The Remington Typewriter Co., for 1923 reports net earnings of $1,678,657 after reserves for depreciation and taxes against $1,166,272 in 1922. After payment of interest charges and preferred dividends, the company reported a surplus of $1,238,159, against $859,-419 after the same reductions in the previous year. After allowing for the regular dividends on both the first and second preferred stock the company reported a balance available for the common stock equal to $8.38 a share on the $9,996,000 common stock outstanding. In 1922 the company earned $2.77 a share on the common stock.

The Union Carbide & Carbon Co. reports for 1923 net earnings of $16,264,-414 after all expenses, charges and taxes and dividends on the preferred stock, against net earnings after the same deductions of $11,716,114 in 1922. The net earnings were equal to $6.09 a share earned on the 2,659,733 shares of common stock, against $4.40 a share in 1922.

Rastall Will Personally Investigate Europe's Machinery Markets

Sailing June 3 for Extensive Visit to Many Countries

In anticipation of an increasing demand in Europe for machine tools and industrial machinery generally, Walter H. Rastall, chief of the Machinery Division of the Department of Commerce, will sail June 3 to gather first-hand impressions as to the steps which American manufacturers may take to insure their securing the maximum possible amount of this business. Since Europe's buying power is not likely to reach a point for a long period to come which will justify American machinery manufacturers in the maintenance of branches, Mr. Rastall will investigate the extent to which importers in European countries may be induced to add an American machinery specialist to their staff.

Under present conditions, Mr. Rastall believes such a plan promises most for the American manufacturer. He expects to call on the larger importers of machinery in the principal countries. He believes many of them can be induced to try out the plan of employing an American with practical experience in the sale and distribution of machinery. Mr. Rastall will give particular attention to the firms engaged in the distribution of machinery in Russia, Poland, Austria, Czecho-Slovakia and Jugo-Slavia. It is these countries, he believes, which are likely to place the largest machinery orders during the next two years. He does not mean to neglect Germany, France, Italy and Great Britain, but he recognizes that most American manufacturers have established connections in those countries. Due to the fact that they have machinery industries of their own, a relatively larger amount of business, in which Americans may hope to participate, is likely to come from the other countries.

Suffered by the War

Fundamental conditions in Poland, Austria, Czecho-Slovakia and Jugo-Slavia have improved greatly during the last six months, reports to the Department of Commerce show. All of those countries have been suffering acutely for several years because of the lack of machinery. It is believed that purchases will be made just as fast as the economic situation will permit. As there is evidence that they are going to be increasingly better off, Mr. Rastall feels that first-hand information is necessary to determine exactly how the market is to be reached under the changed conditions.

Before the war, the machinery needs of that portion of Europe embraced by the countries mentioned, were handled through German agents. This distribution now, however, is almost entirely in the hands of French and Swiss firms. Through their distributing organizations, prospective purchases would be reported. With an American attached to the company's headquarters staff, it then would be possible to send him to the prospective purchaser when the size of the expected order would justify it.

While Mr. Rastall will not visit Russia, he expects to call upon machinery dealers in other countries who are catering to the Russian market. Russian machinery purchases in 1923 totaled $3,000,000. The prospects are that much larger purchases will be made this year. Despite the failure of the United States to recognize the Soviet Government, the United States seems to be getting a fair share of the Russian machinery business. The market is becoming a sufficiently important one to justify some study as to how Americans may get more of the business.

Senator Capper Urges Vocational Training

We are educating 90 per cent of our youth to be white-collar workers, but have white-collar jobs for only 10 per cent, declared Senator Capper, of Kansas, in a recent editorial. The result of this over-production of white-collar workers is bound to be as disastrous, economically, as over-production in wheat or agricultural products, he says.

"Our industries clamor for the trained worker," says the editorial, "but our schools continue to turn out thousands upon thousands of young men and women fitted only for already over-crowded professions.

"Many different reasons are assigned by historians for the fall of the Roman Empire. Rome, however, did not fall until the Romans grew too proud to labor. Neither physically, morally, nor economically can any white-collar nation long endure. The fiber, stability, and soundness of American life depend on establishing the dignity of labor, not as a copy-book maxim, but as a national habit of mind."

"A trade, vocational training for all is the complement of a balanced education," in his opinion. "Without such training for its citizens, the United States cannot maintain its traditions, its national health, nor its place in the world. We must educate hand as well as head. Such training builds character as well as self-reliant independence. We are beginning to see it and certainly none too soon."

Business Paper Editors Meet in Washington

On March 24 and 25, the Business Paper Editors of the National Conference met in Washington, where they discussed national problems with members of the cabinet and other high officials.

Dwight F. Davis, Assistant Secretary of War, told of plans for industrial preparedness. Details of the work were explained by Col. Ferguson and Col. Hunt.

Secretary Wallace told of the problems confronting the farmer and outlined some of the activities of the Department of Agriculture. Other officers of the Department of Agriculture who addressed the conference were W. B. Greeley, Chief Forester, and T. H. MacDonald, Chief of the Bureau of Public Roads.

Secretary Hoover discussed industrial problems and other topics. Postmaster General New told of conditions in the Postoffice Department and gave figures showing the magnitude of the work.

During the conference, editors were taken on a trip of inspection through the Government Printing Office and visited the galleries of the House and Senate.

Auto Makers Announce New Models

W. C. Durant has brought out a lighter, smaller and lower priced Flint Six model, known as the "Flint Forty," while the standard model is the "Flint Fifty-Five." It will be made at the Flint factory at Long Island, N. Y., for the present, but is likely to be also made later at the Flint plant in Flint, Mich. Only the 5-passenger touring model has been completed as yet, but officials stated that the line will eventually include standard types of enclosed models. It has a wheelbase of 115 in. Balloon tires and four-wheel brakes are standard equipment.

A special Star roadster has been added to the Star line of the Durant Motor Co. of Michigan and is now ready for delivery. It will sell at higher prices than the regular roadster and will have a special body furnished in radio blue with white striping, black upholstery and olive green top. The Durant plant at Michigan anticipates a production of approximately 7,000 Stars and Durant fours in March, this number being increased to 10,000 in April and 11,000 in May.

New Jewett Model

A Jewett model called the business coupe has been produced by the Paige-Detroit Motor Co., Detroit. This car is produced as a standard model only, including the regular Jewett chassis.

The Hudson Motor Car Co. announces a new seven-passenger de luxe sedan. It is mounted on the standard Hudson super-six chassis.

Plans are now being made by Durant to bring out a new car known as "Eagle." Mr. Durant, Carroll Downs and Charles F. Daly, leading executives of Durant Motors, Inc., are the incorporators of the Eagle Engine Works, which recently received a Delaware charter. The new company has an authorized capital of 2,000,000 shares of no par value common stock. The new engine plant will be located in Flint, Mich.

The Pierce-Arrow Motor Car Co. has entered upon a program of expansion that includes production of a moderately priced passenger car built to present Pierce-Arrow standards of quality, according to Myron E. Forbes, president, at a meeting of Pierce-Arrow distributing and dealer organization at the factory. The new models will be introduced in midsummer.

England's Hopes for Machinery Trade

Letting Down the Barriers Against Germany—Employment Conditions Improved in Most Lines—List of Conventions at British Empire Exposition

By Our London Correspondent

THOUGH the skies have been, and probably will continue to be, darkened by a succession of strike clouds, a little sunshine manages to break through, and, while of late public revenue has been exceeding the budget estimates, and the most recent returns on overseas trading are not unsatisfactory, the registered unemployed have been reduced to about one and one-tenth million. The fall has been continuous for several weeks, in effect ever since the new government came into operation, though doubtless this is but a coincidence. For, up to the present in dealing with the problems of unemployment, apart from certain administrative actions, the government have merely adopted the expedients of their predecessors; so that, once again, the more it changes the more it remains the same. But we are to expect something with more ginger in it a little later and meanwhile—yet again—are to wait and see. The strikes and strike threats relate mainly to wages rates and cover quite a number of the industries of the country, so that recently 1¼ million workers were thus demanding higher wages. For some months the tendency has been in the direction of increase rather than reduction of wages. During the past few weeks the engineering workpeople have made claims, but locally. It is understood that all such applications have been refused, on the ground that the matter demands a national settlement.

The Two Industrial Classes

As for some time past, the industries of the country divide themselves into two classes, those that are naturally in what has been described as a sheltered position and those that have to meet competition from abroad. From the injustices that result spring much of the current unrest. To take outstanding cases, the building trades and railway workers have increased their weekly wages rates by perhaps 100 to 150 per cent, this without reference to the shortening of the working week, whereas skilled men in the engineering trades have obtained considerably less than 50 per cent advance, and many shipbuilding workers less than even 25 per cent advance, while the official cost of living figures, on which many claims are based, have risen by almost 80 per cent, and show no sign of immediate decline. Again, the unskilled have raised their wages to a larger extent than the skilled, and, to take an instance, a laborer or helper of an electrical worker may be in receipt of higher wages than the skilled engineering workman almost at his side.

The unfairness of present rates is admitted by all engineering employers, but their answer, which they regret, is that it is impossible to take more out of the industry than comes into it. While improved employment conditions are reported, it is well to remember the adage about looking a gift horse in the mouth. Some of our industries are almost without unemployment, and certain branches of the building trade have long had a shortage of men. On the other hand in marine engineering, shipbuilding and ordinary engineering about 20 per cent are unemployed. The improvement in general is in a large measure due to schemes promoted for the immediate purpose of providing work; these schemes are artificial in character in that they do not naturally arise out of ordinary trading conditions.

Foreign Trade Necessary

People of all classes are now pretty well in agreement that the recovery of foreign trade is necessary before the troubles of unemployment are removed. There is no need to discuss the problems of the exchanges and their bearing on overseas trading. The flight from the franc, its causes and effects, needs no comment here. But the growing tendency to get on trading terms with Germany should be recorded and note may be made of the lapse of the five years' embargo imposed on its members by the Machine Tool Trades Association in connection with journals carrying German advertisements. The general position as regards overseas trading has been put into a nutshell in a recent statement to the effect that for every £100 of imported goods at pre-war rates we are now paying £153, while for £100 worth of goods at pre-war rates we are asking £189. At home, wholesale prices have advanced about 8 per cent in the last six months.

Thus far during the current year, British exports of the machinery class have shown a decline. Some advance is reported in electrical and agricultural machinery, but a large decline in textile machinery, the values of these goods sent abroad during the first two months of the year being £1,844,010 against £3,533,904; similarly, of machine tools the value sent abroad was £193,543, against £268,725. But two months of the year afford a somewhat narrow basis for comparison purposes.

Our civil air service is being reorganized under a single company instead of four, and a subsidy of £1,000,000 will be spread over 10 years. The air port at Croydon, just outside London, is being enlarged and separate platforms will be provided for departure to Paris, Amsterdam, Berlin and so on. There has been talk of a London to New York journey in 12 hours and of engines of 1,600 hp. under construction, with 12-cylinder 3,000 hp. engines as a possibility. The Air Ministry are, in fact, on the point of testing a 1,200-hp. six-cylinder engine. Experience has shown that on the present services passengers can be carried at a fare of about 4d. a mile. This applies to the London to Paris route, presuming a load of from 30 to 40 passengers a day, and the fare is not so very greatly in excess of the ordinary first-class rate now in operation. The Dutch government service carried out between London and Amsterdam similarly costs the passenger but a few shillings more than the ordinary first-class fare, while in the time occupied there is of course no comparison. The writer not long ago took about two and a half hours as against more than 12 hours by boat and train. It is claimed that airplanes can now fly 1,500 hours without overhaul, and that the pilot can fly from 500 to 600 hours a year, and more if necessary. The 4d. a mile fare is based on flights made last year by four Handley-Page machines which carried about 4,000 lb. and covered nearly 33,000 miles, at the rate of about 40d. a mile or 22d. a ton-mile.

Convention Dates

London is looking forward to the advent of a considerable number of American visitors during the summer, largely in connection with the British Empire Exposition which, according to present arrangements, will be opened at Wembley on April 23. Here a series of conferences will be held, four congress halls having been specially built for the purpose. Looking only at sicentific and technical conferences the following list may be given: British Engineers Association, May 21 and 22, June 24 and 27, September 17, October 15 and 16; British Science Guild, May 30 and 31; Chemical Association, July 10; World Power Conference, organized by the British Electrical and Allied Manufacturers' Association, June 30 to July 12; Institute of Mining and Metallurgy, June 3 to 6; Gas Association, May 13 and 14, June 9 and 23; Illuminating Engineering Society, August 12; Institution of Automobile Engineers, June 23; Institute of Transport, September 19; Society of Dyers and Colorists, June 11 and 12; Glass Technologists, May 27; International Labor Legislation, July 21; and Industrial Art, September 26. The Machine Tool Trades Association too have postponed their annual meeting so as to hold it at Wembley some time during the month of June.

We are to have a census of production in 1925, to relate as closely as possible to the calendar year 1924. Manufacturers, mining, building, fishery and agriculture will be covered.

Notes on Washington Activities

By Paul Wooton

Hearings before the House military affairs committee on the various pending measures to conscript the material resources of the country as well as men in the event of future war have developed, thus far, unanimous support of the principle involved, although witnesses have differed widely in their ideas of how the subject should be approached through legislation.

While the end of the hearings is not in sight, the committee reverting to this subject at every favorable opportunity, the attitude of committee members indicates a favorable report either on a resolution for the creation of a commission to study the subject fully and report a year hence or on a composite bill aimed at price control, profit limitation and wage control.

The majority of the committee members have expressed themselves as favorable to some legislation to prevent profit being made during war by either capital or labor in excess of a just and reasonable profit enjoyed in times of peace.

There are several bills and resolutions along this line pending before the committee and while hearings began on a resolution by Representative McSwain and a bill by Representative Royal Johnson, the whole subject has been opened up without regard to the particular provisions of any specific measure.

Special studies being made of the super-power situation at the instance of Secretary Hoover, are revealing that the progress in interconnection of electric lines is proceeding at an amazing rate. The extent to which interconnection has been taking place has not been appreciated entirely because this is the first time that data covering this situation throughout a large area has been brought together at one place.

The survey now in progress shows that the great electric utilities are pushing out their lines with great rapidly and are replacing large numbers of steam plants operated as a part of the individual establishment. It already is indicated, according to the engineers who are studying this problem, that some day in the future the great service of supplying power will be located largely in great plants as near the source of coal supply as a supply of condensing water will permit.

THE COMMERCE DEPARTMENT PLAN

The Committee on Interstate and Foreign Commerce of the House of Representatives is disposed to press for an early vote the bill which gives a permanent legislative status to the foreign service of the Department of Commerce. Unexpected opposition arose to the measure from other departments of the government based on the fear that the Department of Commerce might encroach upon some of the prerogatives of the foreign service of other departments. The feeling among the members of the House Committee, however, is that the better service which this will give American business and American interest generally far outweighs the trepidation of other departments as to a possible technical invasion of their respective jurisdictions abroad. Apparently the bill does not meet the approval of the American Protective Tariff League, as it has given publicity to adverse comment on the measure and a statement to the effect that Secretary Hoover and Director Klein of the Bureau of Foreign and Domestic Commerce are "entirely out of sympathy with the Republican doctrine of adequate protection of American industries."

The House Committee, however, has amended the bill in a way which it believes will prevent any conflict between the foreign services of the Government.

Secretary Hoover regards it as almost inconceivable that an establishment on which the Government is expending a million dollars a year should be constantly menaced by the whim of anyone who might be in a position to make a point of order against the appropriation. The million dollars is being expended, he points out, in the interest of the promotion of American trade and in the securing of vital commercial and economic intelligence. The great re-adjustments in world commerce which have followed the war, he says, has necessitated much more deliberate strategy in our commerce.

The Federal Reserve Business Summary

The following summary of conditions is outlined in the current Federal Research Bulletin:

"Employment at industrial establishments increased in February and the output of basic commodities was slightly larger. Distribution, both at wholesale and retail continued large; wholesale prices were somewhat higher; and there was a further increase in the volume of borrowing for commercial purposes.

"The Federal Reserve Board's index of production in basic industries, adjusted to allow for length of month and other seasonal variations, increased less than 1 per cent in February. Production of pig iron, steel ingots, and flour increased, while mill consumption of cotton and production of cement and lumber declined. Factory employment advanced 1 per cent in February, following successive decreases during the three preceding months. Increases in working forces were reported by most industries and were particularly large at iron and steel plants, automobile factories, and textile finishing establishments. Fuller employment through reduction of part-time work is indicated by an increase of over 5 per cent in average weekly earnings. Building activity was slightly less than in January, though contracts awarded were 7 per cent larger than a year ago.

"Railroad shipments in February were in greater daily volume than in January and car loadings of practically all important commodities were larger than a year ago. The daily average volume of wholesale business increased about 5 per cent in February, but was slightly smaller than a year ago."

Philadelphians Hear Rastall's Speech

An interesting conference under the auspices of the Engineers' Club of Philadelphia, and the Philadelphia Section of the A.S.M.E., with the cooperation of the Machine Shop Practice Division of the A.S.M.E. was held at the Engineers' Club, Philadelphia, March 25. Following an inspection of the U. S. Destroyer Tender, "Dobbin" that is under construction at the Philadelphia Navy Yard, luncheon was enjoyed at the club.

The afternoon was given over to addresses and discussions with Prof. William H. Kavanaugh, chairman of the Philadelphia Section of the A.S.M.E., presiding. J. A. Smith, general superintendent of the General Electric Co., and chairman of the Machine Shop Practice Division, A.S.M.E., was the first speaker heard. B. H. Blood, general manager of the Pratt & Whitney Co., Hartford, Conn., spoke on "Some Limitations on Manufacturing to Close Limits." The paper dealt with specifying manufacturing tolerances judiciously. "Machining Massive Parts of the World's Largest Prime Movers" was the title of the paper presented by Edwin J. Armstrong, assistant engineer of plant, the William Cramp & Sons Ship & Engine Building Co.

The evening session was given over to the speech delivered by W. H. Rastall, Chief of the Industrial Machinery Division of the Department of Commerce. Mr. Rastall's subject, "Machine Tools—The Export Problem," was printed in full in the March 27 issue of the *American Machinist*. Preceding the evening session an informal dinner was enjoyed by those attending. The meeting was conspicuously successful and well attended.

Southern Roads Will Purchase Cars

The Interstate Commerce Commission is expected to approve the issuance of equipment trust certificates so as to permit the following purchases of railway equipment:

Southern Railway Co.: switch engines, $668,000; Mallet engines, $399,750; box cars, $3,680,000; express cars, $149,480; mail-baggage cars, $122,130; mail cars, $42,720; hopper-bottom cars, $823,500; gondola cars, $1,630,000; passenger coaches, $520,000; dining cars, $222,500.

Seaboard Air Line: Mail-baggage cars, $96,100; dining cars, $86,000; business car, $76,000; caboose cars, $91,250.

The issue of securities by the Seaboard Air Line is to cover also the rebuilding of 299 phosphate cars; 289 flat cars and an unstated number of other types of cars.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price

Editor, *Commerce and Finance*, New York

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IN THE business world fact and feeling are strangely in contrast. Nearly all the indicia of trade reflect activity, but in the speculative markets where short sales are practicable prices are generally lower, and it is undeniable that confidence in the future is weakening. Bank clearings, railroad earnings, car loadings, retail sales, postal receipts, telegraph tolls, and all the other data by which merchants and manufacturers usually shape their course indicate a turnover that is in excess of last year. But wheat, corn, and cotton are lower, and the stock market is drooping with but little resistance to the bearish attacks that are from time to time made upon it. The thoughtful student of affairs is puzzled to account for the incongruity. There are some who attribute it to what is called the "scandalmongering" in progress at Washington, but this is an explanation that is not entirely satisfactory. Others say that the growing distrust is due to the growing fear that we may have a radical for the next President of the United States.

The fact that Hiram Johnson has defeated Mr. Coolidge in the South Dakota primaries has undoubtedly increased the apprehension of those who profess to be thus alarmed.

Then there is Poincare's resignation and his reacceptance of the French premiership with the uncertainties of the national elections that are to be held in France on May 4 and in Germany on May 11. One observant merchant with whom I talked last week said, "It's really a widespread fear that democracy has broken down that's making men nervous," but he added, "There's no justification for that fear. I recollect the days of our Civil War and the period of reconstruction that followed it. American democracy was sixty years younger then. Many were predicting that it could not survive, but it emerged from the crisis stronger than ever and so it will be this time.

"It is necessary to clean out the Augean stables at Washington about once in a generation, but our willingness to undertake the job should be reassuring rather than disturbing."

I quote this sagacious observation at length for the benefit of those who may be worried at the seemingly inexplicable mistrust that has become so pervasive. And to it I may add that there is no possibility of the panic that some alarmists predict, for the very good reason that the first essential of a panic—"distension"—is lacking.

I doubt if there was ever a time in the history of American business when stocks were smaller in proportion to the normal turnover than at present.

What's Doing in Industry

Business continued slow duirng the past week in the machinery and machine tool lines with but little expectation of any great improvement, although hope is entertained for better business during April. Railroads are still buying and some of the industrials are potential customers.

The electrical business keeps up at a good pace according to authorities in that field and indications are for another record year.

Iron and steel markets are active, but mostly for construction and railroad work. The mills are better able to take care of work than for some years past, due to increased facilities in most plants.

General business is peculiarly mixed and no one line can be said to be indicative of future conditions. Retail sales are excellent, money is easy, employment is good, crops are fair, and food and textile commodities plentiful at fair prices. But the stock market has continued to go down for the past ten days at an alarming pace. No amount of effort has been able to stem the bear raids recently made. This condition is in direct contradiction to the otherwise prosperous general condition.

Politics are still without marked influence on business.

The pessimists are welcome to make the most of the foregoing if it describes conditions that breed depression. I cannot see it and have no hesitancy in advising those merchants who need goods to buy their full requirements, relying upon a normal demand at fair prices.

As to the speculative securities usually carried on margin, it is hardly possible to speak with such confidenee, for the stock market is becoming unfashionable and the interest that it formerly attracted is waning. It will continue to wane unless the Stock Exchange allows its members to advertise its business and their own.

But the low priced railway shares are very cheap when their earnings are taken into consideration, and higher prices for them may be reasonably expected.

Cotton is about two cents lower on the widely proclaimed and probably exaggerated curtailment of manufacturing activity chiefly in New England. The demand for cotton goods is said to be very poor, but constant re-orders for small quantities are reported.

Preparations for the new cotton crop are admittedly late, and the increase in acreage seems likely to be negligible.

The demand for iron and steel keeps up wonderfully well, but the nonferrous metals—copper, lead, zinc and tin—have moved irregularly as their dollar and sterling value has been somewhat affected by the fluctuation in European currencies. The major commodities are unchanged.

Call money has ruled somewhat higher, but time money continues in abundant supply at former rates. The weekly statement of the Federal Reserve Banks shows no important changes. The reserve ratio is unchanged at 80.8 per cent and a reduction in the rediscount rate is again being demanded by the agrarian members of Congress. The financial markets in London are called stagnant. This condition is attributed to the tramdrivers' strike and the threat of a lockout in the shipbuilding industry. The political developments in France and Germany and the deferred hope of an early settlement of the reparations question have also had a quieting effect. But American bankers still believe that General Dawes will get results, and the New York market is being prepared for a German loan of $100,000,000 in May or sooner. The franc seems to have been stabilized around 5.40. A republic has been declared in Greece. General Garcia Velez of Cuba is in New York and issuing bulletins in which it is alleged that the present Cuban government is outrageously corrupt. This about completes the week's record. None of the happenings noted are especially significant. The question of the future is largely one of confidence in ourselves and our insistence upon decency, probity and fidelity at Washington.

The Industrial Review

What the year has yielded and some predictions for next year's production

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

New York

The month of March was not as good as either February or January for the dealers in the New York district but hopes are entertained that business will pick up during April and May. Selling is by no means dull but it is not what was anticipated or what was indicated during the first few weeks of the year.

Inquiries as well as sales fell off during the past two weeks of the month and dealers say that every effort on the part of the salesmen is necessary to consummate deals.

Railroads are buying better than is usual for them with orders coming from the New York Central, Lehigh Valley, Delaware, Lackawanna and Western and Canadian roads.

Textile machinery was sold last week to some extent and some tools were also delivered to manufacturers in the New England district.

Used tools found a ready market during March and indications were that this demand would keep up during the remainder of the year.

Locomotive and freight car builders were purchasers during the week and this source is being solicited by machine tool men.

Exporting continues good with predictions favoring improvement during the summer months. European buying is expected after the first of May and some South American purchasing.

Buffalo

Dealers in machinery in the Buffalo district report that business is still good but that it has not forged ahead in the past couple of weeks as it did for several weeks before that date. In fact, there had been a distinct bettering of business for nearly two months up to about the first week in March and from then on the machinery business has been holding its own, but no longer showing improvement. It is satisfactory to note that the present business is considerably better, for most firms, than business during the same period of either 1922 or 1923.

Feeling for the future is optimistic. Many conditions in the Buffalo market give reason for this optimism. One is that the Pierce Arrow buying, on account of putting a new model car on the market, has scarcely started and yet the impetus of Pierce Arrow orders has helped keep the business solid in this market. The company has not yet made decision as to whether certain parts are to be made outside or in the plant and as soon as these matters can be settled it is understood that Pierce Arrow will at once go ahead with an extensive machinery-buying program, all for immediate delivery. This would seem to assure a certain steadiness to the market for some months ahead.

Yet there are adverse factors for the future. One is that the equipment of the Herschell-Spillman Motor Co., which went into the hands of receivers several months ago, may soon be put on the market and this unloading of a large quantity of used machinery would tend to hold back sales of new equipment somewhat. However, it is understood that no effort will be made to unload the entire plant equipment in Buffalo.

The Buffalo office of the State Employment Bureau reports that there is at the present time practically no demand for machinists of any kind. However, there is sufficient demand for all other kinds of help from steel mills and metal trades to indicate that whatever let down there may be is only temporary.

A feature of the present demand for machine tools, according to one of the biggest dealers in the Buffalo territory, is that it is of a miscellaneous nature and spread out over many customers. No one item or line seems to be outstanding in sales and the demand for both used and new machinery continues active.

Cincinnati

There has been noticeable improvement in the machine tool industry of Cincinnati during the past few weeks. Although operations at the present time are proceeding on a basis of approximately fifty per cent of plant capacity indications point to an increase within a short time, according to machine tool executives who have been interviewed. More inquiries are being received at present than for a number of months and some of these are already developing into worth-while business. Probably the most active purchasers of machine tools at the present time are the automobile manufacturers who have been in the local market placing substantial orders in the last month. The quantity of business placed from this source has increased markedly within the past fortnight. Railroads, which have been holding off making their purchases of machinery, are now about ready to place some business. Railroads have bought but little this year and have delayed in their placing of orders beyond the time that had been anticipated. The little business that has been placed by the railroads has been confined mostly to small tools and to the cheaper type of machinery.

Milling machines are having a fair sale at the present time with production speeding up somewhat lately. Lathes have had a spotty market with sales reported to be increasing slowly as compared with a month ago. Electrical tools continue to find a ready market and conditions in this branch of the industry are good. The automobile manufacturers have been making large purchases of electrical tools and this fact has resulted in a strengthening of the local market. Planers are selling well with several manufacturers fairly well satisfied with conditions in this field. Woodworking machinery manufacturers are still operating at capacity with no indications of a falling off in their production in the near future. Conveying machinery plants are sold months ahead and are in an extremely prosperous condition.

Philadelphia

The machine tool industry in the Philadelphia district has not developed any hopeful signs. The delay in tax legislation at Washington and the promise of a bonus bill, which will keep up the tax level, have contributed to the general sluggish condition of the industry. Inquiries are not of sufficient number to indicate any immediate revival of the industry.

The investigations now under way have created a political situation which also has contributed to the uncertainty.

Manufacturers of flour milling machinery are giving their attention to the production of blending machines for bakeries. The call for flour milling machinery has slumped to a very great extent, producers say.

The monthly statement of the Federal Reserve Bank shows a decrease in employment in machine shops. The retail trade in all lines has been good, and buyers report a satisfactory situation in most mercantile lines.

Cleveland

Expected improvement in machine tool demand in March has not arrived as far as the Cleveland manufacturers are concerned. A slight spurt at the beginning of the month has not held up, and with the exception of a few scattered orders for miscellaneous equipment the business has not developed to any marked extent. Of the lot the planer, automatic, punch, shear and similar equipment producers seem to have a shade the better of what business is coming forward, and the best inquiry at the moment seems to be coming from the steel car makers.

While the activities of Cleveland interests are not confined entirely to the immediate Cleveland district, a goodly portion of the business must naturally fall in Cleveland and vicinity by reason of the essentially industrial

condition of the territory. In this connection the influence of a sale of machine tools cannot be underestimated. This is the disposal of the Winton company's tool equipment, liberally advertised "at exceedingly low prices." It includes an unusually wide variety of machines. Naturally this event has had its retarding influence, and for the time being, makers of new equipment cannot help but feel it, they admit.

The industrial activity now under way in northern Ohio ought to bring that long looked for machine tool demand, and this in part may account for the inquiry, if not the orders, that has been evident for the last six weeks.

More industrial plant construction is under way or contemplated for this year than in any year since 1918. About $18,000,000 work of this kind is involved. And of particular value to the machinery trade is the fact that foundry and automotive interests lead in the projects planned.

Detroit

Care that the market does not become saturated has led to a decline in production plans of many of the automobile concerns in Detroit and vicinity.

Passenger car production this month is likely to fall considerably below the figure set during February. Price flurries appear to be things of the past, not more than two or three changes being expected before the middle of the summer, and many prospective buyers are awaiting warmer and better weather.

Fear of loading the market has resulted in a slight lull in the machine tool field, the automotive plants preferring to await re-actions in the country during the next few weeks before entering heavily into the market themslvs.

Chevrolet at Flint is working upon a four-day-a-week schedule, while Buick has laid off several thousand men. Whether this condition will long exist can only be determined as time passes.

Executives in the machine tool field assert that there is nothing to fear because of present conditions in the automotive factories. Several large orders give backing for an optimistic feeling, although not as much speed is being shown as was thought likely a few weeks ago. Factories making the cheaper grade cars continue on the schedules as they were planned.

Chicago

A fair volume of demand for machine tools continues in the Chicago district. Industrial purchases are mostly of single tools, although the steel companies, Western Electric Co., Chicago, and Fairbanks, Morse & Co., Beloit, Wis., either have made rather sizable purchases or have outstanding inquiries. The Chicago, Milwaukee & St. Paul Ry. is in the market for used equipment, but may purchase a few new tools. The Santa Fe Ry. has not started purchase on its extensive outstanding list.

Manufacturers in the metal trades are doing a fair volume of business in the Chicago district, but it does not equal this period last year. The manufacturers of automobile parts and accessories are doing a very good business and some of them are working their forces overtime. However, their purchases of machine tools are not up to expectation.

The Youngstown Sheet & Tube Co., Indiana Harbor, Ind., is inquiring for one 30-in. x 24-ft. motor driven lathe, one 600-ton wheel press, one 7-in. two spindle centering machine, and one motor-driven drill grinding machine. The Inland Steel Co., and Illinois Steel Co., Chicago, have pending lists of machine tools and machinery wanted. The National Tube Co., Pittsburgh, is constructing a plant at Gary, Ind., and will require considerable equipment which probably will be purchased at Pittsburgh. It is reported that machine tool and special machinery purchases of the Western Electric Co., Chicago, during the past six weeks have involved the expenditure of about $225,000. Fairbanks, Morse & Co. have purchased about eight machine tools for their Beloit, Wis., plant.

Personals

JOHN E. PARKER, formerly factory manager for the Spencer-Smith Machine Co., Howell, Mich., has organized a company to take over the American Bell & Foundry Co., Northville, Mich. The new company will be known as the Bell Furnace & Manufacturing Co.

T. S. OVERMAN has resigned as superintendent of the Detroit Gear & Machine Co., Detroit, Mich.

WILLIAM N. WOODRUFF, formerly vice-president and treasurer of the Seifreat-Woodruff Co., Dayton, Ohio, has retired and his interest has been purchased by ERNEST C. ELSTAD, Henceforth the company will be known as the Seifreat-Elstad Machinery Co.

CHARLES H. KEITH has been appointed temporary receiver for the Wells Corp., Greenfield, Mass.

E. D. MITCHELL, formerly New York manager for Alfred Herbert, Ltd., Coventry, Eng., has been appointed manager for the India branch with headquarters at Calcutta.

CHARLES LONGENECKER, formerly sales engineer with the Bonnot Co., Canton, Ohio, has become associated with the Combustion Engineering Corp., 43 Broad St., New York City.

T. WOOF, for many years London manager for Alfred Herbert, Ltd., Coventry, Eng., has resigned.

E. J. ROBERTSON, manager of the Wright Distributing Co., Flint, Mich., has purchased the Industrial Tool & Manufacturing Co., Mt. Morris, Mich. The company will be re-capitalized at $500,000 and a new plant constructed and equipped.

C. W. COLLIER has been appointed London manager for Alfred Herbert, Ltd., Coventry, Eng.

JAMES A. ALLISON was elected a director of the Union Carbide & Carbon Co., New York, succeeding Joseph P. Day.

JAMES CRADDOCK, formerly with the Norton Co., Worcester, Mass., and also the Heald Machine Co., Worcester, Mass., has been appointed district manager for the Australasia district for Alfred Herbert, Ltd., Coventry, Eng. His headquarters will be at Sydney.

FRED W. ENZENBACHER, formerly in charge of the byproducts department of the Fisk Rubber Co., has become a members of the Buckley Foundry Co., Springfield, Mass., and is manager of sales and service. P. J. FITZGIBBONS, formerly with the Palmer Foundry Co., has been made superintendent of production for the Buckley company.

GRANVILLE A. RICHEY, BENJAMIN H. RHYNEARSON, and FRED SCHELLENBERG, formerly with the Vonnegut Machinery Co., Indianapolis, Ind., have incorporated a new machinery house to be known as Richey-Rhynearson Machinery Co., and have leased a three story building at numbers 23 and 25 East South St., Indianapolis, Ind., where they will engage in the selling of new and rebuilt machine tools. Mr. Richey and Mr. Rhynearson are well known to the machine tool manufacturers and dealers throughout the country.

S. P. ROCKWELL, consulting metallurgist of Hartford, Conn., addressed the Springfield chapter of the American Society for Steel Treating at Springfield, Mass., March 25. His talk dealt with carburizing case hardening and difficulties in measuring case depths.

CLAYTON O. SMITH, who is general manager of the O. S. Walker Co., Inc., Worcester, Mass., has been elected vice-president and general manager of the Heim Grinder Co., Danbury, Conn.

Obituaries

NORMAN E. ZUSI, aged 41 years, died recently at his home in Newark, N. J. Mr. Zusi was president of the Meisselbach-Catucci Manufacturing Co., Newark, and had been connected with the company since 1910.

SIDNEY L. E. ROSE, for 15 years an engineer in the Illuminating Engineering laboratory of the General Electric Co. at Schenectady, died March 17 in St. Louis.

Garrett W. Logan, age 80 years, a citizen of Terre Haute, Ind., for seventy-three years, died recently at his home. For thirty-three years preceding his retirement in July, 1922, Mr. Logan was instructor in shop practice at the Rose Polytechnic Institute.

JOHN G. LEACH of Warren, Mass., for several years with the Knowles Steam Pump Co. in Worcester, Mass., and one of the founders and the first president of the Warren Steam Pump Co., of Warren, Mass., died in that town March 22 on his 84th birthday. He had retired from the company 15 years ago.

Business Items

The Cadillac Machinery Co., Detroit, Mich., has been appointed eastern Michigan representative for Henry Pels & Co., Inc., New York City.

The Bicknell-Thomas Co., of Greenfield, Mass., has been reorganized with the following officers: Leon E. Turner, president and treasurer: Herbert M. Darling, secretary and mechanical engineer. Directors, Leon E. Turner, Herbert M. Darling, Winthrop T. Noyes and Maurice J. Levy. The new organization will continue to manufacture the Bicknell-Thomas line consisting of tapping machines, reversing tapping attachments, tap chucks, releasing tap holders, and thread lead indicators, as well as to take in contract work and build special tools and machinery.

The branch factory of the American Fork & Hoe Co., at Wallingford, Vt., was totally destroyed by fire on March 17, causing a loss of $135,000. The fire started in the basement, when a kerosene engine exploded.

Glengarry Metal Wares, Ltd., has recently been organized at Alexandria, Ontario, with an authorized capital of $100,000. They have purchased the property formerly used by the Schell Foundry & Machine Co., Ltd. and have moved there the machinery and equipment of the Leslie Tinware Co., Ltd., Ottawa. F. A. Leslie who held a controlling interest in the latter company, is vice-president and general manager.

The Muzzy-Lyon Co. and the Federal Bearing & Bushing Corp., Detroit, Mich., have merged and henceforth the company will be known as the Federal-Mogul Corp. Both companies are well known to the industry.

Lombard & Co., Boston, Mass., manufacturer of grindstones, are now New England distributors for Standard Grinding Wheels manufactured by the Sterling Grinding Wheel Co. of Ohio.

The Ottawa Car Co. has been awarded a contract by the Ottawa Electric Railway for fifteen steel cars.

The plant of the Mansfield Steel Co., Detroit, Mich., which was recently taken over by the Fisher Body Corp., will be used for the stamping work of the latter company. All stamping work for the corporation's district branches will be made here.

Headquarters of the C. G. Spring & Bumper Co. were formally transferred from Kalamazoo, Mich., to Detroit at the annual meeting of that company's stockholders and directors in Kalamazoo, March 14. Meetings of the stockholders and directors hereafter will be held in Detroit.

The Arion Steel Co., Boston, Mass., has moved to larger quarters at 239-241 Franklin St.

Net income of the Chicago Pneumatic Tool Co. of $812,036 after all charges and Federal taxes for 1923 is equal to $7.39 a share on $10,976,600 capital stock against $505,818 or $4.44 a share on $11,381,900 stock in 1922.

The C. Schmidt Co., an Ohio corporation, capitalized at $350,000, has been authorized to manufacture and sell machinery and office, store and bank fixtures and supplies in the state of Indiana. The Indiana capital is $29,-166 and the Indiana agent is Bernard Korbly, 600 Indiana Trust Building, Indianapolis, Ind.

General offices of the Stout Metal Airplane Co. have been opened in the General Motors Bldg., Detroit, where they were moved from their former location at the plant.

Office and warehouse of the Cleveland, Ohio, district office of the Merchant & Evans Co., of Philadelphia, have been moved to 3125 Perkins Ave., where a warehouse, twice the size of the one vacated downtown, has been opened.

The Superior Steel Products Co. has been organized at Monaca, Pa., with a capitalization of $1,000,000. The incorporators and offices are: M. P. Simpson, president; William Elmes, vice-president; Homer H. Swaney, treasurer, and F. H. Guppy, secretary. Messrs. Simpson, Elmes and Guppy were formerly with the Noltrup Steel Products Co. and the Standard Gage Steel Co., Beaver Falls, Pa.

The Nash Motors Co., Kenosha, Wis., on March 22 formally took possession of the real estate and buildings of the defunct Mitchell Motors Co., Inc., Racine, Wis., purchased in January at trustee's sale for $405,000. The property embraces 35 acres of land and modern factory buildings with 600,000 sq.ft., having an appraised value of $1,095,000. The Nash company is withholding definite announcement of purpose and policies pending the completion of a survey and inspection to determine the necessary changes and equipment needs, the buildings having been purchased bare of all machinery.

Catalogs Wanted

The Shanghai Engineering Co., 416 Rue Auguste Boppe, Shanghai, China, requests catalogs and price lists on pumping machinery, hoists, traveling cranes, air compressors, pneumatic tools, machine tools and surveying and drawing instruments.

Pamphlets Received

The American Ways. Published by the Bank of the Manhattan Co., New York City. This little booklet is published in the hopes that the text will add to the better understanding of railroads and transportation problems in general. It has been much discussed in recent newspapers and magazine sections of metropolitan publications. It is attractively illustrated by Raymond Perry.

Inventive Industry and Resourceful Government. By Julius Barnes. Published by the United States Chamber of Commerce, Washington, D. C. The speech that was delivered by Mr. Barnes at the Eastern Division Regional Meeting, Philadelphia, Pa., is printed in this booklet.

Steinmetz and His Discoverer. By John T. Broderick. Published by Robson & Adee, Schenectady, N. Y. This little sketch of the late Dr. Steinmetz reviews the work that this electrical genius did and a short but interesting history of his life in this country.

Bankruptcy Reform. The Merchants' Association of New York. A report of the committee on bankruptcy reform recently made to the association. At this particular time when bankruptcy laws are being discussed this booklet assumes greater value. It is an exhaustive study of the evils and complications of the present bankruptcy laws.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Electrical machinery and generators. Genoa, Italy. Agency. Reference No. 9474.

Mechanical machinery, equipment, specialties, and appliances. London, England. Agency. Reference No. 9509.

Machine tools. Genoa, Italy. Agency. Reference No. 9474.

Saws for woodworking mills. Hanau, Germany. Purchase and agency. Reference No. 9463.

Electrical equipment for automobiles. Belfast, Ireland. Purchase and agency. Reference No. 9619.

Machine repair shop equipment. Saloniki, Greece. Agency. Reference No. 9611.

Machinery and implements for industrial work. Trieste, Italy. Purchase and agency. Reference No. 9622.

Textile mill machinery and accessories. Saloniki, Greece. Agency. Reference No. 9611.

Woodworking machinery. Saloniki, Greece. Agency. Reference No. 9611.

Forthcoming Meetings

National Metal Trades Association. Twenty-sixth annual convention. Hotel Astor, New York City, April 23 and 24. L. W. Fischer, National Secretary, Peoples Gas Building, Chicago, Ill.

American Gear Manufacturers Association. Spring Meeting. April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

American Society of Mechanical Engineers. Spring meeting. Cleveland, Ohio. May 26, 27, 28 and 29. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

National Association of Purchasing Agents. Annual Convention, Mechanics Hall, Boston, May 20, 21, 22 and 23. W. L. Chandler, secretary, 19 Park Place, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Division V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924. V. R. Hawthorne, secretary, 431 S. Dearborn St., Chicago, Ill.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

American Society for Testing Materials. Twenty-seventh annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Week of June 23. C. L. Warwick, secretary-treasurer 1315 Spruce St. Philadelphia, Pa.

American Society for Steel Treating. Sixth Convention, Boston, Mass. Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig-iron buying confined to small tonnages. Price of No. 2 foundry iron down about 50c. per ton from last week's level. Reserve stocks dwindling. Steel mills operating at 90 per cent of capacity. Railroad and structural steel form the bulk of current buying. Reinforcing bar market dull; most quotations at $2.40 base. Plates quoted at range of $2.25@$2.50 and shapes, $2.30@$2.50 per 100 lb., Pittsburgh.

Non-ferrous Metals—Market tending downward in all non-ferrous metals except antimony. Short stocks of the latter have led to a firmer tone in the domestic market.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.50@23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	$2.90@3.00	4.34	3.75	4.00
No. 12	3.00@3.10	4.39	3.80	4.05
No. 14	3.10@3.20	4.44	3.85	4.10
No. 16	3.30@3.40	4.54	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.65	4.45	4.70
Nos. 22 and 24	3.75	4.70	4.50	4.70
Nos. 25 and 26	3.80	4.75	4.55	4.75
No. 28	3.85	4.85	4.65	4.85
Galvanized				
Nos. 10 and 11	3.90@4.00	4.90	4.70	4.85
Nos. 12 and 14	4.00@5.10	5.00	4.80	4.95
Nos. 17 and 21	4.30@4.40	5.30	5.10	5.24
Nos. 22 and 24	4.45@4.55	5.45	5.25	5.40
No. 26	4.60@4.70	5.55	5.50	5.55
No. 28	4.90@5.00	5.85	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
¼	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	3.90	4.30
Cold drawn flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55@60%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			51.50
Lead (up to carlots), St. Louis	8.62½	New York	9.25
Zinc (up to carlots), St. Louis	6.35	New York	6.80

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	28@29	30.00	28.50
Antimony (Chinese), ton spot	13.50	13.25	10.25
Copper sheets, base	21.75	21.75@22.00	23.00
Copper wire, base	17.25	19.75	16.25
Copper bars, base	20.75	23.25	19.50
Copper tubing, base	23.75	28.00	23.00
Brass sheets, base	18.25	22.50	18.75
Brass tubing, base	22.50	27.50	20.50
Brass rods, base	16.00	18.50	15.75
Brass wire, base	18.75	22.50	....
Zinc sheets (casks)	10.75	11.00	....
Solder (½ and ½), (case lots)	39.00	41.50	30.00
Babbitt metal (83% tin)	60.00	64.00	48@52
Babbitt metal (35% tin)	28.00	21.50	22@25
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.50@11.00	11.50	11.50
Copper, heavy, and wire	10.00@10.75	11.00	10.75
Copper, light, and bottoms	8.00@9.75	10.00	9.75
Lead, heavy	7.12½@7.75	7.00	6.00
Lead, tea	4.00@6.50	4.50	5.00
Brass, heavy, yellow	5.37½@7.00		7.25
Brass, heavy, red	7.62½@9.25	10.00	9.00
Brass, light	4.62½@6.00	6.00	6.25
No. 1 yellow brass turnings	5.12½@7.00	6.50	6.75
Zinc	3.62½@4.00	3.50	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$24.30	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	20.20	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.20	$0.14
Cotton waste, colored, per lb.	.09@.12½	.17	.10½
Wiping cloths, 13¼x13¼, per lb	11.75	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.50	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.08	.94
Lard cutting oil, 25% lard, per gal.	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber and duck:			
First grade	50%	50–10%	40–10%
Second grade	50–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.00@4.50
Coke, prompt foundry, Connellsville	per net ton		5.25@6.50
White lead, dry or in oil	100 lb. kegs		New York, 15.00
Red lead, dry	100 lb. kegs		New York, 15.00
Red lead, in oil	100 lb. kegs		New York, 16.50

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0334
Cold finished shafting	per lb.	0.044	0.044	0.042
Brass rods	per lb	0.16	0.155	0.1962½
Solder (½ and ½)	per lb.	0.39	0.3675	0.37
Cotton waste	per lb.	.14@.21	.14@.21	.10@.13
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.58	0.58	0.55
Machine oil	per gal.	0.29	0.29	0.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	45%	45%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1¼ and 1½x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	45%	.....	60–5%
Square and hex. head cap screws	60%	75%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	05%	50–5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅝ and smaller	65%	.....	.....
Semi-finished nuts, ¾ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.35	.....	0.15
½ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$3.70 base

New and Enlarged Shops

Machine Tools Wanted

Conn., Bridgeport—R. F. Moore, 214 Ellsworth St.—15 in. x 5 ft. Hendy lathe, Universal back geared miller, Universal grinding machine, 18 in. crank back geared shaper, hacksaw, small lathe, two sensitive drill presses, bench grinder, four bench vises, filing machine and other small tools for shop.

Mass., Lawrence—Lawrence Motor Co., 218 South Bway.—18 in. x 8 ft. lathe, hacksaw, grinder, pipe threading machine, miscellaneous small tools and upright drill to take up to 2 in. drills.

Mass., Reading—Ace Art Co.—precision bench lathe, milling attachment (used).

N. Y., Binghamton—Binghamton Auto Lamp & Radiator Wks., 247 Water St., P. Goodman, Purch. Agt.—sheet metal forming rolls and shear.

N. Y., Brooklyn—M. Kamenstein, 135 Pearl St.—drawing press, Bliss No. 3½ or 4.

N. Y., Gloversville—C. H. Miller, 11 Montgomery St.—tool room lathe for repair shop and garage.

N. Y., Hoosick Falls—Lovejoy Chaplet Co., Inc., R. Brownell, Purch. Agt.—two automatic screw machines, to work round brass, same as B. & S. No. 00 or 0.

N. Y., New York—John Kunst Co., 43 Murray St. (wood and metal patterns, etc.) C. Stricker, Purch. Agt.—14 in. x 6 ft. quick change gear lathe, draw in attachment, including collets (used).

N. Y., New York—Wilson Mfg. Co., 137 Grand St.—Bliss press No. 21, also V. & O. press No. 4.

N. Y., Walton—W. D. Osgood—bench lathe and attachments, Goodell-Pratt No. 494 or similar; bench drill and circular saw with table.

O., Athens—Athens Fdry. & Machine Co., M. L. Yussar, Proprietor—24 in. lathe, grinder, etc.

O., Cleveland—Markad Motor Sales Co., c/o M. Zettemeyer, 13310 St. Clair Ave.—generator stand, small lathe, portable drill, burnisher and steel oil tanks.

O., Middletown—Weber Tool, Die & Machine Co., A. J. Weber, Purch. Agt.—equipment for machine shop, including milling machine, 24 in. lathe and grinder.

O., Ravenna—Churchill-Clark Motor Co., F. H. Clark, Mgr.—equipment for repair shop and service station.

Ore., Portland—Amer. Ry. Car. Co., 613 Henry Bldg., A. D. Brown, Purch. Agt.—about $100,000 worth of machinery, including lathes, drills, shapers, heavy hydraulic presses and plate formers, for proposed factory at Tigard.

Pa., Pittsburgh—Carnegie Steel Co.—about 20 machine tools for new machine shop at Homestead.

Wis., Milwaukee—Frado Clamp Co., c/o J. J. O'Brien, 505 48th St.—presses and drills for the manufacture of special chain for auto trucks.

Wis., Milwaukee—Zuehlke-Stoehr Heating Co., 236 24th St., G. Stoehr, Purch. Agt.—pipe cutter.

Wis., Neenah—L. A. Williams, 218 West Wisconsin Ave.—sheet metal working machinery, including shear and brake.

Ont., Napanee—E. O. Unger—vertical post drill for garage.

Ont., Sydenham—U. F. Blakslee—grinder, air compressor, gasoline pump and tank for garage.

Que., Montreal—P. Labelle, 721 Dorchester St.—complete equipment for new $150,000 garage.

Que., Montreal—E. K. Malouf, 542 St. Zotique St.—complete equipment, including drill, lathe, gasoline tank, etc., for garage and automobile repair shop.

Que., Verdun—City, H. Hadley, City Hall, Purch. Agt.—repair equipment for new garage.

Machinery Wanted

Ia., Oelwein—Bd. Educ., G. A. Kidd, Secy.—receiving bids until Apr. 8 for manual training equipment for new high school.

Kan., Kansas City—City, G. T. Darby, Purch. Agt.—portable air compressor.

Kan., Kansas City—Kansas City Can & Mfg. Co., 1019 North 4th St.—equipment for proposed $100,000 factory.

Ky., Henderson—Henderson Sand & Gravel Co.—7 x 9 in. 2 drum hoisting engine.

Ky., Owensboro—Wright Mchy. Co.—steam hammer for welding oil field stems.

Mass., Boston—Salem R. R. Terminal, 200 Devonshire St.—conveying machinery.

Mass., Falmouth—School Com.—wood and metal working machinery, including saws, tables, benches, pulleys, shafting, belting, lathes, planer, drill and various small tools.

Mass., Malden—Marcia C. Broune School—manual training equipment for proposed $350,000 school.

Mo., St. Louis—W. T. Byrnes, 7320 Lyndover Ave.—air compressor, 8 x 8 air drill and steam drill.

Mo., St. Louis—A. Hiller Vinegar Co., 127 Loughborough Ave.—small planer and joiner.

Mo., St. Louis—W. M. Sikes, 1330 South 7th St. (woodwork)—saw, medium size.

N. Y., Buffalo—City, Room 5, Municipal Bldg.—one tire setter, for wheels from 5 ft. to 30 in. diameter, and to set 1 x 4 in. tires, weight 14,000 lbs., 10 sets dies, 2 shims, 3 plunger pumps, guard for pump and pulley.

N. Y., Green Island (Troy P. O.)—J. A. Manning Paper Co., J. Foy, Purch. Agt.—one Collender roll grinder, rolls, 24 x 72 in.

N. Y., Waverly—Frank & Dugan, Broad St.—special machinery and equipment for the manufacture of silk ribbon.

Pa., Hollidaysburg—Blair Co. Comrs., C. H. Edwards, Clk.—receiving bids until Apr. 15, for 8 x 10 x 17 ft. refrigeration plant and 400 lb. capacity ice machine.

Pa., Munhall (Branch of Homestead)—J. O. Snyder, 410 11th Ave.—planing mill equipment.

Tex., San Antonio—M. Halff & Bros., 330 East Commerce St. (printers)—12 x 18 in. Gordon printing press (new or used).

Tex., San Antonio—Lone Star Ice Co., 120 Jones St.—equipment, including Frick ammonia compressor, etc., for 20 ton ice plant at Luling.

Wis., Bloomington—Bd. Educ., G. Ballentine, Clk.—woodworking and bench tools, etc., for manual training department.

Wis., Delavan—Hetzel Milling Co., J. Hetzel, Purch. Agt.—grinding mill, sorters, conveyors and graders for flour and feed mill.

Wis., Milwaukee—O. H. Kindt Mfg. Co., 986 47th St.—woodworking machinery, including band and ripsaw, planer, sticker, sander and mortiser, each with individual motor drive, for proposed $75,000 factory.

Wis., Milwaukee—West End Publishing Co., c/o C. A. Rusch, 4023 Vliet St.—presses, paper cutter and stereotyping outfit.

Wis., Waukesha—Quality Aluminum Casting Co., Lincoln Ave.—casting machines.

Wis., West Allis—W. Hass, R. F. D.—revolving crane for gravel pit.

Ont., Hawkesbury—Hawkesbury Lumber Co., Ltd.—sawmill equipment.

Ont., London—Toasted Corn Flakes Co., W. Spittal, Pres.—special equipment.

Ont., Rockland—Gatineau Co., Ltd.—machinery and equipment for the manufacture of lath.

Que., Campbells Bay—Smith Bros. (sawmill)—heavy rip and bandsaws.

Que., D'Israeli—E. Gagne—bakery machinery and equipment.

Que., Lake Megantic—A. Moisau—equipment for bottling plant.

Que., Three Rivers—Cremerie Canadienne, 238 De Lavendyre St., P. C. Clouthier, Mgr.—pasteurizing equipment.

Que., Three Rivers—Cremerie des Trois Rivieres, 92 Plaisante St., A. Blais, Mgr.—pasteurizing machinery.

Metal Working Shops

Calif., Martinez—Alhambra Union High School Dist. plans to build shops for manual training departments.

Calif., Monrovia—The Day & Night Solar Heater Co., 902 South Myrtle St., is having plans prepared for the construction of a 1 and 2 story, 150 x 200 ft. factory on Foothill Blvd. Hamm & Grant, Ferguson Bldg., Los Angeles, Engrs.

Calif., Oakland—The Illinois Wire & Cable Co., Sycamore, Ill., is having plans prepared for the construction of a factory, consisting of a group of six buildings, on 80th Ave., here. Estimated cost, first unit $40,000, total $250,000. W. J. Miller, 417 Market St., San Francisco, Archt.

Calif., Oakland—The Niedringhaus Metal Ware Corp., 5739 Natural Bridge St., St. Louis, Mo., plans to build a factory on a 5 acre site along tracks of Southern Pacific and Western Pacific R.R., here. Cost will exceed $50,000.

Calif., Oakland—The Puget Sound Auto Co., c/o W. A. King, Bank of Savings Bldg., plans to build a plant for the manufacture of automobiles on a 5 acre site.

Calif., Watsonville—Watsonville High School Dist. plans additions to shops. T. McQuiddy, City School Supt.

Ill., Melrose Park—The Electrical Engrs. Equipment Co., 710 West Madison St., Chicago, is having plans prepared for the construction of a 1 story factory on a 17 acre site, here. Estimated cost $150,000. Woodmansee-Davidson Eng. Co., 208 South La Salle St., Chicago, Engrs.

Ia., Marshalltown—The Fisher Governor Co., manufacturer of steam specialties, is having plans prepared for the construction of a 2 story, 60 x 80 ft. addition to its factory. J. H. Fisher, Pres. Private plans.

Kan., Kansas City—The Fairfax Iron & Steel Co. is having plans prepared for the construction of a 1 story, 160 x 700 ft. steel, iron and malleable casting factory. W. W. Shaw, Pres. Horner & Wyatt, 306 McMillen Bldg., Kansas City, Mo., Engrs.

Kan., Kansas City—The Kansas City Can & Mfg. Co., 1019 North 4th St., is having plans prepared for the construction of a 4 story can factory. Estimated cost $100,000. Private plans.

Kan., Kansas City—The H. Darby Missouri Boiler Wks., 923 North 3rd St., plans to build a boiler plant on a 26 acre site.

Minn., St. Paul—The Ronning Mchy. Co., 300 Washington Ave., plans to build a factory near new Ford plant. Estimated cost $75,000. A. G. Ronning, Pres. Engineer or architect not announced.

N. Y., Albany—The Albany Garage Co., 28 Howard St., awarded the contract for the construction of a 10 story garage on Beaver St. Estimated cost $750,000. C. D. Hakes, Treas.

N. Y., Hornell—The New York Central Electric Corp. plans to build a 4 story manufacturing building on Bway. Cost between $150,000 and $175,000.

O., Cleveland—The Knutsen Motor Trucking Co., 1730 Oregon Ave., awarded the contract for the construction of a 1 story, 100 x 173 ft. garage, etc., on East 21st St. and Oregon Ave. Estimated cost $150,000. O. F. Knutsen, Pres.

O., Cleveland—The Motor Repair & Mfg. Co., 1549 Hamilton Ave., awarded the contract for the construction of a 1 and 2 story, 60 x 100 ft. and 20 x 60 ft. addition to its factory. Estimated cost $40,000. Noted Mar. 6.

O., Cleveland—The Sanitary Tinning Co., c/o A. J. and O. C. Miller, 3753 East 93rd St., awarded the contract for the construction of a 1 story, 54 x 104 ft. factory. Estimated cost $40,000.

O., Elyria—The Elyria Iron & Steel Co. awarded the contract for the construction of a 1 story factory. Estimated cost $50,000. Noted Mar. 6.